

Understanding the Land Cooperative Program in China: Determinants and Impact

DISSERTATION

zur Erlangung des akademischen Grades

Doctor of Philosophy
(Ph.D.)

eingereicht an der
Lebenswissenschaftlichen Fakultät der Humboldt-Universität zu Berlin

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Tag der mündlichen Prüfung: 20. November 2017

ACKNOWLEDGEMENTS

The thesis would not be possible without the help of my colleagues and friends. I would like to thank Prof. Dr. Markus Hanisch for providing me the opportunity to work in his division. His contributions of time and ideas have enriched my research. I am grateful to Prof. Dr. Futian Qu, Prof. Dr. Shuyi Feng and Prof. Dr. Xiaoping Shi. They were my supervisor and daily supervisors when I was in China. With their support I had the chance of being an exchange student in Germany, which started the journey of my study at Humboldt-Universität zu Berlin. I also thank their significant input to data collection.

I am also grateful to Dr. Jens Rommel and Malte Müller. Their contributions have significantly improved the empirical chapters. The thesis has also benefited from comments and suggestions made by my colleagues Dr. Julian Sagebiel, Agustina Malvido Pérez Carletti, Carla Dohmwirth, Margitta Minah and Marleen Thürling. In addition, administrative support from Renate Judis, Reinhold Wilhelm, Esther Robbe and Gerlinde Behrendt made my stay in Berlin easy.

Finally, I would like to thank my parents and wife. Their love, patience and understanding over the years of research have been invaluable.

SUMMARY

Over the past decades, co-management of natural resources has been on the political reform agenda of many developing countries. However, the empirical knowledge on the success factors of co-management and its social-economic impact remains limited. This thesis contributes to the understanding of politics and processes of co-management using data from the Chinese land cooperative program. The aim of the land cooperative program is to consolidate agricultural land by encouraging individual households to transfer land to land cooperatives and then to collectively manage the land. In my dissertation, I analyze household and village level data from two cities, Suzhou and Yangzhou, in Jiangsu Province, China. At the core of this thesis is the question how local context and household' characteristics interact with the implementation of the land cooperative program.

I address this question in three empirical papers. In paper one, I explore the impact of different local context variables on the relative amount of land managed by land cooperatives across villages. Special attention is paid to the effect of local elites when they are cooperative leaders. It is shown that local context successfully explains the variation in the proportion of land dedicated to land cooperatives at the village level. In particular, when cooperative leaders are local elites, such as government officials, village cadres, or are more educated, the proportion of land transferred to the cooperative is found to be larger.

In paper two, I investigate the determinants of households' cooperative membership and its implication on labor allocation. Do different households decide differently on cooperative membership? Are member households more likely to have off-farm employment? Household heads' off-farm experience and land endowments generally increase the propensity of households to become member in the cooperative. We do not find a general effect of cooperative membership on household heads' current off-farm employment, although there is a large effect for households which had more agricultural

labor before cooperative initiation.

In paper three, I analyze how cooperative members participate in decision-making processes. In addition, we analyze the relationship between participation in decision-making and households' income derived from cooperative membership. It is shown that cooperative members' engagement in decision-making processes differs along their characteristics. In particular, wealthier members and those with communist party membership are more likely to participate in decision-making processes. This generally confirms earlier findings from case studies that local elites often dominate the decision-making process in co-management programs. More importantly, the paper finds that cooperative members benefit less if they are not engaged in decision-making processes, indicating a lack of equitable representation in the governance of land cooperatives.

The thesis in general shows that local contexts matters to the implementation of the land cooperative program. To encourage participation, policy-makers should be aware of the heterogeneity of the local population and more accurately take into account the specific local context and households' characteristics. The role of local elites should be acknowledged in the design of the next generation of land cooperatives.

ZUSAMMENFASSUNG

In den letzten Jahrzehnten steht zunehmend das Ko-Management natürlicher Ressourcen auf der Reformagenda vieler Entwicklungsländer. Das empirische Wissen über Erfolgsfaktoren des Ko-Managements und seine sozial-ökologischen Konsequenzen ist jedoch begrenzt. Diese Doktorarbeit trägt durch eine Analyse der chinesischen Landgenossenschaften zum Verständnis von Politik und Prozessen im Ko-Management bei. Das Ziel der chinesischen Landgenossenschaften ist es, landwirtschaftliche Flächen zu konsolidieren, indem Haushalte dazu angeregt werden, ihre Flächen an die Genossenschaft zu übertragen und dann das Land gemeinschaftlich zu verwalten. In meiner Dissertation analysiere ich Haushaltsdaten und Beobachtungen auf der Dorfebene aus einer Zufallsstichprobe in zwei Stadtkreisen, Suzhou und Yangzhou, in der Jiangsu Provinz in China. Im Mittelpunkt dieser Arbeit steht die Frage wie der lokale Kontext und Haushaltscharakteristika mit der Implementierung von Landgenossenschaften interagieren.

Ich adressiere diese Frage in drei empirischen Forschungsartikeln. Im ersten Artikel untersuchen die Koautoren und ich die Wirkung verschiedener lokaler Kontextvariablen in verschiedenen Dörfern auf den Anteil der Landflächen, der von einer Landgenossenschaft verwaltet wird. Der Fokus liegt insbesondere auf dem Effekt lokaler Eliten, wenn sie als Genossenschaftsvorsitzende fungieren. Es wird gezeigt, dass lokale Kontextvariablen die Varianz zwischen Dörfern in Hinblick auf den Anteil an Landflächen, die an die Landgenossenschaft übertragen werden, erklären können. Insbesondere wenn lokale Eliten, wie Regierungsbeamte, Dorfkader oder gebildete Menschen, Genossenschaftsvorsitzende sind, ist der Anteil von Land, der an die Genossenschaft übertragen wird, deutlich größer.

Im zweiten Artikel wenden die Koautoren und ich uns der Haushaltsebene zu und untersuchen Bestimmungsfaktoren der Mitgliedschaft in einer Genossenschaft und die Auswirkungen der Mitgliedschaft auf die Allokation der verfügbaren Arbeitskraft.

Entscheiden verschiedene Haushalte auf verschiedene Weise über eine Mitgliedschaft in der Genossenschaft? Sind Haushalte, die Genossenschaftsmitglieder sind, eher in außerlandwirtschaftlichen Bereichen berufstätig? Wir stellen fest, dass vorherige Erfahrungen des Haushaltsvorstandes mit außerlandwirtschaftlichen Tätigkeiten und größerer Landbesitz die Wahrscheinlichkeit der Mitgliedschaft in einer Landgenossenschaft erhöhen. Außerdem zeigen die Ergebnisse, dass für Haushalte, die vor dem Programstart unterschiedlich viel landwirtschaftliche Arbeitskraft aufgebracht haben, andere Bestimmungsfaktoren für die Mitgliedschaft in der Genossenschaft ausschlaggebend sind. Wir stellen keinen allgemeinen Effekt von Genossenschaftsmitgliedschaft auf die Wahrscheinlichkeit der außerlandwirtschaftlichen Berufstätigkeit des Haushaltsvorstandes fest. Gleichwohl ist ein starker Effekt für Haushalte zu beobachten, die vor der Gründung der Genossenschaft mehr landwirtschaftliche Arbeitskraft aufgebracht haben.

Im dritten Artikel analysieren die Koautoren und ich, wie stark Genossenschaftsmitglieder an Entscheidungsprozessen in der Genossenschaft teilhaben. Zusätzlich analysieren wir den Zusammenhang zwischen Partizipation in Entscheidungsprozessen und Haushaltseinkommen aus Genossenschaftsmitgliedschaft. Wir zeigen, dass das Engagement von Genossenschaftsmitgliedern in Entscheidungsprozessen von ihren Eigenschaften abhängt. Insbesondere wohlhabendere Mitglieder und solche mit Mitgliedschaft in der kommunistischen Partei haben eine höhere Wahrscheinlichkeit an Entscheidungsprozessen teilzunehmen. Diese Ergebnisse bestätigen frühere Forschungsergebnisse aus Fallstudien, die besagen, dass lokale Eliten oft Entscheidungsprozesse in Ko-Management Programmen dominieren. Darüber hinaus zeigt der Artikel, dass Genossenschaftsmitglieder weniger von ihrer Mitgliedschaft profitieren, wenn sie nicht in Entscheidungsprozesse involviert sind. Dies deutet auf einen Mangel an gleichberechtigter Repräsentation in der Führung der Landgenossenschaften hin.

Zusammenfassend zeigt diese Dissertation, dass der lokale Kontext einen Unterschied

in der Implementierung von Landgenossenschaften macht. Um die Mitgliedschaft in Genossenschaften zu fördern sollten politische Entscheidungsträger die Heterogenität der lokalen Bevölkerung, ebenso wie die spezifischen lokalen Bedingungen und die Haushaltscharakteristika genau berücksichtigen. Insbesondere die Rolle lokaler Eliten sollte bei der Gestaltung der nächsten Generation von Landgenossenschaften beachtet werden.

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1 INTRODUCTION

1.1 Research Background

1.1.1 Land Institutions and Land Use in China

The governance of agricultural land in China has undergone several reforms. Before 1978, agricultural land was owned and controlled by the state or collective authorities. The authorities organized agricultural production following a planning approach, which was criticized as inefficient (Lin, 1992; Deininger and Jin, 2003). Since the late 1970s, China has made significant progress in the devolution of collective land to ownership similar to private property in the form of the household responsibility system. Under the household responsibility system, land remains collective property. Yet, households can cultivate the land they receive and retain revenues, as long as land tax and grain quota obligation are fulfilled.

Despite the remarkable success of land reform in improving households' access to land (Lin, 1992), land fragmentation has emerged as a side-effect and undermined rural development in the long run (Tan et al., 2006). Land fragmentation refers to the state of small and separated land ownership (King and Burton, 1982). It arises when state-owned or collective land is distributed following the egalitarian principle in the devolution process or redistributed repeatedly according to population change and family splitting (Dijk, 2003; Tan et al., 2006). For example, land distribution under the household responsibility system, according to the Document No.1 issued in 1982 by the Central Committee of the Chinese Communist Party, was on the basis of household size and dependency ratio. Land redistribution occurs every five years or on the request of villagers. This resulted in a great level of land fragmentation, with an average household landholding of 0.53 ha separated into 6.03 plots in 1999 (Tan et al., 2006).

Compared to large-scale farming, fragmented land often encounters higher costs of machinery use and coordination of infrastructure construction (Niroula and Thapa, 2005).

Capital investment in fragmented land, as a consequence, is often insufficient (Dijk, 2003), leading to a loss of efficiency and competitiveness in agricultural production. Subsistence production prevails and commercial production becomes difficult. Moreover, labor input on fragmented land is relatively high, slowing down the progress of labor migration from the farm sector to the off-farm sector. Law which restricts land lying idle adds to the problem. To address the issue of land fragmentation, land rental markets have been encouraged.

Land rental markets could allow households with a comparative advantage in agricultural production to gain access to additional land, to increase their farm sizes and thus family incomes (Deininger and Jin, 2005). Households who rent out land could also benefit by moving to the off-farm sector. Despite of these potential benefits, land rental markets in China remained inefficient (Jin and Deininger, 2009). Until 2006, only 9.93% of the agricultural land had been transferred in Jiangsu Province, one of the most economically developed areas in China. The national average in the same year is even lower (Ito et al., 2016). A major obstacle to the development of land rental markets in China are the high transaction costs resulting from tenure insecurity (Bao et al., 2015).

Although administrative land reallocations have been officially banned, they are still commonly practiced (Deininger et al., 2014; Yan et al., 2014). This practice increases the risk of land expropriation for households which transfer land, because the administration thinks that households do not need it any more (Deininger et al., 2014). A lack of formal land titling or poorly defined property rights add to the problem. Land titling programs can ensure enforceable long-term contracts (Deininger et al., 2014). Without land titling, land transfers often occur on a short-term basis between kin relatives (Jin and Deininger, 2009; Gao et al., 2012). Due to highly fragmented land, transaction costs are particularly high when land users aim to develop large-scale farming, because they have to identify and negotiate with many households. Agency organizations, such as land cooperatives recently emerged in China to promote land markets to reduce land fragmentation (Bao et al., 2015).

1.1.2 The Land Cooperative Program

The land cooperative program is now viewed by the central government as the main organizational form of the collective agricultural economy in rural China (Chen, 2015). Figure 1.1 shows a simple introduction of the land cooperative program. Within the land cooperative program framework, each village may establish a land cooperative to receive land from households who want to quit farming and search for off-farm employment opportunities (Tian and Zhu, 2013; Ito et al., 2016). Often, after some basic infrastructure construction, land cooperatives then utilize the received land for commercial farming. They can either hire employees to farm the land or lease the land to farmers – either from or beyond the community – who would like to extend their farm (Ito et al., 2016). The land cooperative program is expected by the authorities to contribute to scale farming and labor migration from agriculture to other sectors.

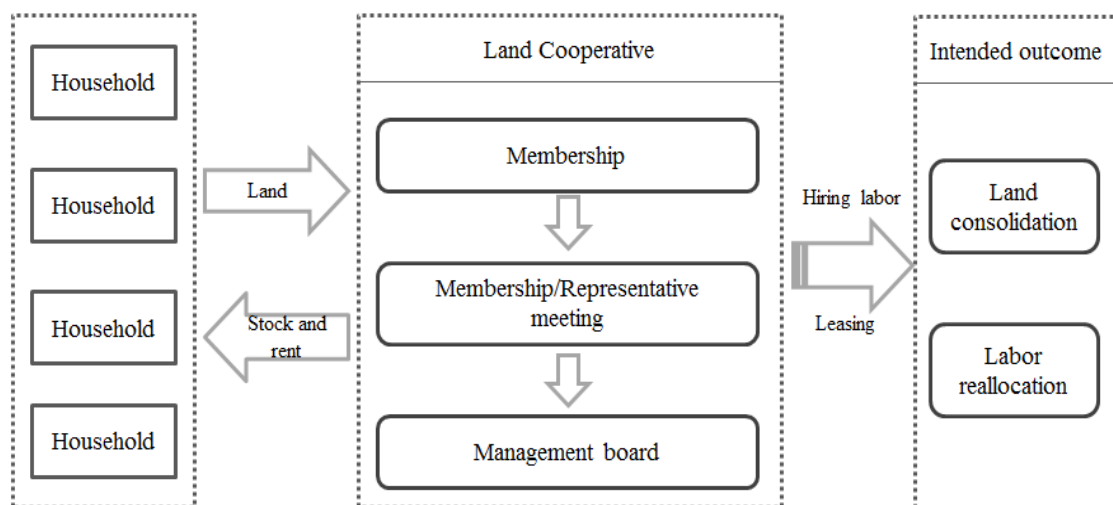


Figure 1.1 A Simple Illustration of the Land Cooperative Program

Households who transfer land to cooperatives become cooperative members and receive benefits from cooperatives which manage the land. Typically, cooperative members benefit in two forms: a fixed income and dividends from the shares (stocks) they own in the cooperative (Chen, 2015). The fixed income component is similar to a rent for the land a household has transferred to the program. It is independent from the

cooperative's profits. The dividend component, in contrast, is based on the cooperative's profit and the shares a household owns. Typically, one mu¹ of land is exchanged for one share in the cooperative. Besides the land area, the total amount of shares a household owns also depends on factors such as household size or labor availability (Yep, 2015). As a result, the land income per unit of land every household receives may differ in the same cooperative program due to differences in household characteristics.

These shares that members receive can be mortgaged, transferred, and inherited, which avoids periodical land reallocation and also ensures tenure security (Po, 2008; Ito et al., 2016). Since land cooperatives become the major transaction partners for land users who want to enlarge their farms and households who want to transfer land out, transaction costs, especially the costs of searching transaction partners, are saved (Bao et al., 2015). A land market has therefore quickly developed after the implementation of the land cooperative program. In 2012, approximately 45% of all agricultural land in Jiangsu Province has been transacted in such rental markets (Ito et al., 2016).

As other cooperative organizations, land cooperatives embrace participatory and democratic principles. According to the *Regulations of Jiangsu Province on Specialized Farmers' Cooperatives (2009)* which officially legitimized the land cooperatives, households may voluntarily decide whether to transfer land to the land cooperative program. Households, as the members of land cooperatives, have the right to participate in major decision-making processes in the organizations, such as devising or revising cooperative regulations, voting for cooperative leadership and receiving cooperative financial information such as investment and income flows. In other words, the land cooperative program establishes co-management governance on land use.

Despite the rapid rise of the number of land cooperatives in rural China, the program

¹ Mu is an unit of area in China. 15 mu equals to one hectare.

remains underdeveloped in some areas, and the impacts of the program are still unknown. Studies on the land cooperative program are mostly rudimentary (Qian and Qu, 2006; Ji and Qian, 2010; Tian and Zhu, 2013; Chen, 2015; Yep, 2015). Except for a few studies (Zhang, 2008; Ito et al., 2016), rigorous empirical evidence on the determinants and effect of the land cooperative program remains limited.

1.2 Research Objective and Data

The overall aim of the thesis is to improve the understanding of the success factors of land cooperatives and their impacts on households. In line with the policy intentions of the land cooperative program, the thesis focuses on three aspects of land cooperatives: the relative amount of land dedicated to land cooperatives in villages, households' cooperative membership and households' engagement in decision-making.

One intention of the land cooperative program is to consolidate fragmented agricultural land. Although land cooperatives have been established in many villages, the relative amount of land dedicated to land cooperatives varies across villages. However, the economic logic behind this variation remains poorly understood in the literature. As for policy makers, no sufficient evidence exists to suggest which types of villages are more likely to succeed in implementing the program. Thus, an analysis of the village and household level determinants of the variation may improve our understanding and provide important implications for policy makers.

The second intention of the land cooperative program is to promote labor migration from the farm sector to the off-farm sector by encouraging household membership in land cooperatives. An evaluation of the program's effectiveness could serve as a basis for further policy making. Moreover, research on how households respond to this program in terms of cooperative membership (land transfer) and what household characteristics determine their responses leads us to the micro level, complementing our understanding of the variation of the relative amount of land dedicated to land

cooperatives across villages.

The third intention of the land cooperative program is to establish a participatory governance structure on land resources. However, many cooperative members in reality do not participate in decision-making processes (Chen, 2015), and there is no analysis in the literature on which types of cooperative members are more likely to participate in decision-making. The economic consequences of the variation in participation in decision-making are also unknown. Filling these gaps could provide insights to both a wider range of research on resource co-management and policy makers in the land cooperative context.

The thesis consists of three empirical essays, and each of them addresses one of the three specific research objectives corresponding to the three intentions of land cooperatives.

1. The first objective of the thesis is to identify the determinants of the relative amount of land dedicated to land cooperatives across villages (Paper one).
2. The second objective of the thesis is to identify the determinants of households' membership decisions and their impact on household members' off-farm employment decisions (Paper two).
3. The third objective of the thesis is to identify the determinants of cooperative members' participation in decision-making and its impact on their access to cooperative benefits (Paper three).

The research site is located in two cities – Suzhou and Yangzhou – in Jiangsu Province, China. The two cities are chosen due to their representativeness of the development of the land cooperative program. The two cities have pioneered the program in the province. They also had the highest numbers of land cooperatives at the time of the data collection. In line with the three objectives, data were drawn from different nested entities.

Objective one concerns the village level and thus structural data from 120 randomly selected villages is used. These villages differ with respect to the proportion of land dedicated to land cooperatives. From the 120 villages, 60 villages were randomly selected. In these 60 villages, 583 households either with or without cooperative membership were surveyed using the random walk technique for objective two. After excluding households without cooperative membership, the remaining households were used for investigating objective three.

1.3 Literature on Resource Co-management

I borrow insights from the literature on resource co-management. Generally three types of property rights regimes – state property, private property and common property – have been distinguished (Feeny et al., 1990). The governance of natural resources under state property in transition economies generally reflected political rather than economic objectives and caused inefficiency in resource management and in turn in production (Macours and Swinnen, 2000). In the pace of system changes and reform efforts, state property has been declining and replaced by private property, which, however, only achieved efficiency improvement at the initial state of transition but not in the long run (Mathijs and Swinnen, 2001). Inefficient markets in transition economies undermine the success of private property (Libecap, 2009). As an alternative to the state and private property on natural resources, common property or co-management has been highlighted (Ostrom, 1990; Berkes, 2009).

Co-management is an important concept in the governance of natural resources (Ostrom, 1990; Agrawal, 2001). Different types of cooperatives and community-based organizations are in use. Co-management refers to a range of institutional arrangements for joint decision-making by the state and local resource users (Berkes, 2009). In particular, local resource users under a co-management scheme are encouraged to participate in decision-making processes on the use of collective resources which may also affect their livelihoods. By involving different levels of stakeholders,

co-management generally reflects both national and local users' interests. In practice, it may take many forms, but generally involves different degrees of shared management authorities or responsibility (Ayers and Kittinger, 2014).

As a hybrid between state and private property, co-management has two potential advantages. First, co-management can be more efficient than state property because local users are arguably more familiar with resource conditions, thus they may manage resources in a way that better fits the local context conditions (Kumar, 2002). Second, co-management may also mitigate market failure: Though private property may also promote the efficient use of resources, it often needs complete property rights and efficient markets for those resources, which is rarely the case in developing countries (Libecap, 2009). In recent years, co-management has been on the political agenda in many developing countries (Mansuri and Rao, 2012).

A potential disadvantage of co-management is that it affords collective action (Acheson, 2006). Although some communities have successfully established long-lasting resource co-management, in other communities efforts to manage resources collectively have failed (Ostrom, 1990), i.e., the resource collapsed or only a small portion of the resource is co-managed (Mansuri and Rao, 2012). Moreover, there is the criticism that local elites often dominate decision-making in co-management and benefit disproportionately. In the literature these phenomena are defined as elite control and elite capture, respectively (Fritzen, 2007). Debates on the advantages and disadvantages of resource co-management draw increasing attention from different perspectives in the literature which can be roughly classified into two branches. Table 1.1 summarizes the current literature on resource co-management.

The first branch of literature seeks to understand the success factors of co-management programs (Mansuri and Rao, 2004; Cox et al., 2010; Baynes et al., 2015). Several studies investigate the community level factors of co-management success, measured as emergence, endurance or the amount of resources or resource users of co-management activities in a community (Agrawal, 2002; Cox et al., 2010; Gutiérrez et al., 2011;

Basurto, 2013). Such studies, however, often fail to establish causal links between potential factors and the measure of co-management success due to the use of qualitative analysis with small-N samples or single case studies (Agrawal, 2003). Quantitative analysis using large sample sizes is rare.

Other studies tackle the problem by investigating why some local users are engaged in resource co-management programs while others are not (Beard, 2005; Jumbe and Angelsen, 2007; Jana et al., 2014; Mazunda and Shively, 2015). While these studies generally contribute to our understanding of the success factors of co-management from a micro perspective, they often do not distinguish between different levels of engagement in co-management (Chhetri et al., 2013; Lestari et al., 2015). Many resource users do not participate in decision-making processes, although they might be officially registered as co-management members (Chhetri et al., 2013). The participation of co-management members in decision-making processes, as the most fundamental element of resource co-management (Kabir et al., 2011), to date has rarely been analyzed.

Table 1.1 Literature on Success Factors of Co-management and Its Impact

Levels of Analysis	Collective action level	Membership and labor reallocation	Decision-making and access to benefit
Subjects	Village or community	Household or individual	Household or individual
Literature	Some studies (Agrawal, 2002; Cox et al., 2010; Gutiérrez et al., 2011; Basurto, 2013)	Some studies on membership (Beard, 2005; Jumbe and Angelsen, 2007; Jana et al., 2014; Mazunda and Shively, 2015); no study available for its impact on labor reallocation	No study available
Methodology	Most qualitative studies	Quantitative regression	

Source: Author's own design.

The second branch of literature investigates the social-economic impact of

co-management programs (Mansuri and Rao, 2004, 2012). Several studies focus on the linkages between households' co-management participation and a household's income or access to local resources (Ameha et al., 2014; Mazunda and Shively, 2015; Yadav et al., 2015). The impact of co-management participation on other social-economic aspects, e.g., household labor allocation, has not received sufficient attention. Informed by the commonly known critique on elite capture, some studies investigate the difference in access to benefits between elite and non-elite members (Prokopy, 2009; Persha and Andersson, 2014). However, empirical knowledge on the linkage between members' participation in decision-making processes and access to benefits remains limited.

This thesis borrows insights from and also contributes to these two strands of literature. Although the Chinese land cooperative program is a unique economic phenomenon, it shares many characteristics with the resource co-management programs in other countries. More importantly, the issue of land fragmentation tackled by the land cooperative program is likely to be relevant to many developing countries, particularly transition economies. Thus, research on the success factors and effect of the land cooperative program may provide insights not only for China but also for other countries.

1.4 A Framework for Empirical Analysis

To structure the research process, I first introduce an analytical framework. Analytical frameworks are often a starting point for empirical research. They provide an overview on the relevant theoretical and empirical relationships between the entities under investigation. The main aim of analytical frameworks is to provide insights on potentially important sets of factors or variables and to guide the data collection and data analysis processes.

Figure 1.2 shows the framework, which is a modified version of the Institutional Analysis and Development framework raised by Ostrom (2005). The Institutional Analysis and Development framework summarizes institutional factors, resource

characteristics and resource users' characteristics to understand resource users' behavior and the outcome of co-management schemes. In this thesis, I operationalize the Institutional Analysis and Development framework with the integration of factors taken from the literature on resource co-management and the local context.

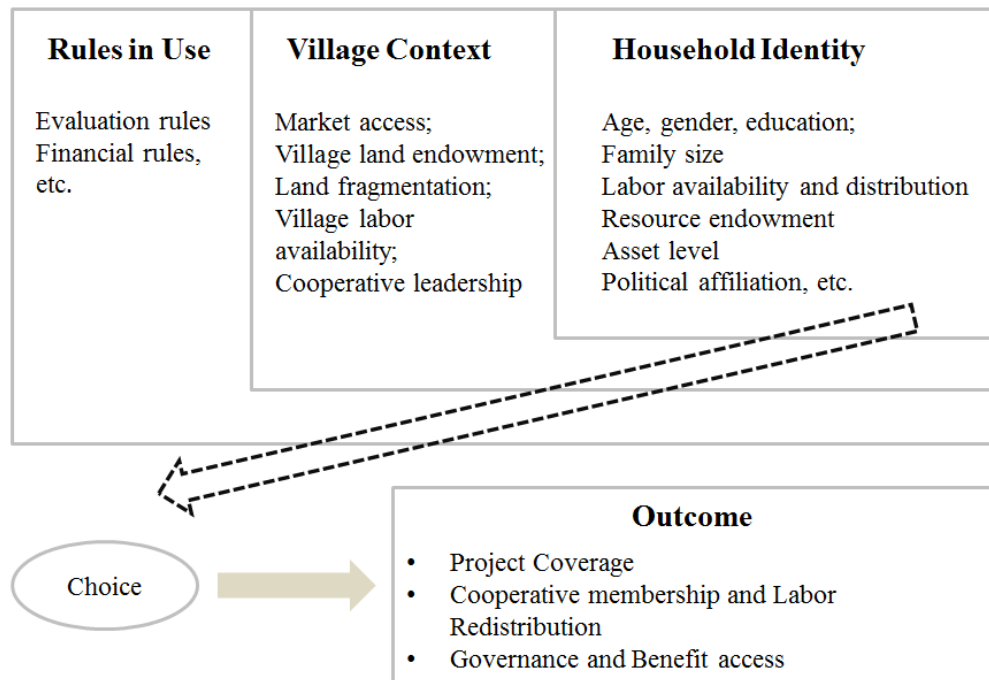


Figure 1.2 An Analytical Framework for Determinants and Impact of Land Cooperatives

Figure 1.2 illustrates that households or individuals voluntarily choose to participate in the land cooperative program or in decision-making processes within the organizations. Such choices are made based on the costs and benefits which are embedded in a household's characteristics, village characteristics, and rules in use. The collective choice of households represents collective action in terms of project coverage at the village level. Simultaneously, the choices of households affect other economic decisions (e.g., labor reallocation) and economic welfare (e.g., access to benefits from land cooperatives).

1.5 Structure of Dissertation

The rest of the thesis consist three empirical papers and a concluding chapter.

The **first empirical paper** in Chapter Two identifies the success factors of land co-management in terms of the proportion of land transferred at the village level. It asks why land cooperatives attract more land in some villages than in others. Given the similarity in the national policy environment, the paper turns to answer the question from the perspective of local contexts, such as differences in the local policy environment, village characteristics and cooperative leadership. The paper pays special attention to the role of cooperative leaders' elite status, such as their education or political affiliations.

The **second empirical paper** in Chapter Three identifies the household level factors of cooperative membership. It explains which types of households are more likely to be a member of the land cooperative program. It also estimates the causal effect of cooperative membership on household heads' decisions to engage in off-farm employment. To address the endogeneity resulting from the simultaneous decisions of being a member in the cooperative and engaging in off-farm employment, the paper employs a recursive bivariate probit model. The paper also contributes to the understanding of household heads' off-farm employment.

The **third empirical paper** in Chapter Four identifies the factors of cooperative members' engagement in decision-making processes and its impact on their access to land incomes from cooperatives. It explains which types of cooperative members are more likely to participate in decision-making processes and whether the participation makes a difference to members' land income from the cooperatives. To address selection bias, the paper applies a novel identification strategy which combines a bivariate probit model with propensity score matching.

In the conclusion chapter, the main findings from the three empirical papers are summarized and synthesized. Shortcomings and potential future directions for research are highlighted. Lessons and policy implications are derived from the empirical work.

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2 EMPIRICAL STUDY I:

COMMUNITY-BASED AGRICULTURAL LAND CONSOLIDATION AND LOCAL ELITES: SURVEY EVIDENCE FROM CHINA

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Published in: Journal of Rural Studies 47, pp. 449-458

DOI: 10.1016/j.jrurstud.2016.06.021

Abstract: Land consolidation is an essential aspect of rural restructuring in China. Community-based agricultural land consolidation projects were developed to restructure the agricultural sector by pooling fragmented land and leasing it as consolidated plots or employing laborers to farm the land. Despite the rapid growth in the number of villages that generally adopt the approach, the relative amount of farmland managed under the program remains low, and empirical studies explaining this variation are scarce. We investigate the drivers of land coverage under the program with a particular interest in the role of local elites and village characteristics. Using primary data from 120 villages in Suzhou City and Yangzhou City, China, our study shows that projects led by government officials achieve greater coverage. Other local elites do not play an important role in the process. Further investigation indicates that the roles of different types of elites change over time. We also find that structural village characteristics such as distance to town, village land endowment, and off-farm market participation substantially affect project outcomes. The results are robust to different samples and different specifications of the econometric model. Rather than generally excluding elites from leadership positions, policymakers should actively promote certain types of elites whose involvement might be critical for project success.

Keywords: Cooperatives, land fragmentation, land markets, elite capture, Jiangsu Province

2.1 Introduction

Rural China has experienced a rapid transition in the structure of its labor and land. As a result of China's economic growth, massive labor migration from rural to urban areas has occurred (Li et al., 2014; Siciliano, 2014). Because primarily old and female farmers remain active in farming (Chen et al., 2009) and rapid changes in the use of land (from agricultural to construction use) are taking place, concerns regarding national food security and the future of Chinese agriculture more generally have arisen (Long et al., 2009; Su et al., 2011). Land fragmentation caused by industrialization, urbanization (Long et al., 2007), and an egalitarian land distribution (Yan et al., 2014) adds to the problem by increasing the cost of agricultural production and machinery use. This transition has altered the marginal productivity of labor and land, raising the issue of rural restructuring (Long et al., 2016).

Land consolidation represents an indispensable means of restructuring agricultural resources in rural China (Long, 2014). Agricultural land consolidation can address the challenges arising from a loss of human capital, land fragmentation, and low agricultural productivity because it involves concentrating land to encourage intensive farming (Long et al., 2010; Demetriou et al., 2012; Huang et al., 2015). Chinese governments have begun to initiate agricultural land cooperatives (or *nong di gu fen he zuo she* in Chinese) to facilitate land consolidation with two objectives. First, the program aims to concentrate land plots by encouraging land transfer to land cooperatives. By consolidating scattered land, which is complemented by the provision of basic infrastructure in some cases, land cooperatives can more successfully promote large-scale farming. Second, land cooperatives acknowledge that households must voluntarily participate in land transfers and the management activities of the cooperative organization (Chen, 2015). Key decisions (e.g., the development of cooperative rules or the election of leaders) are made in a democratic manner (Ito et al., 2016). Thus, the land cooperative program can best be described as a co-management program of land use or community-based land consolidation (CBLC).

By the end of 2012, thousands of villages in Jiangsu Province had initiated land cooperatives. In several villages, no farmland has been transferred through the program. However, other villages report that all farmland has been transferred. An understanding of the local forces underlying the variation of rural restructuring programs is critical (Long et al., 2012). Investigations of local drivers of program development can improve our understanding of CBLC and lead to important implications for policymakers at different legislative levels. The national government might include land consolidation and the development of rural land markets in its overall frameworks. Provincial governments and city governments may then develop more detailed policies, programs, and schemes that are adapted to local conditions.

Previous work explored the factors of households' willingness to participate in CBLC (Lin and Ma, 2014). Households that participated in the program reported higher incomes, especially from off-farm sector employment (Zhang, 2008). More recently, Ito et al. (2016) find that the establishment of the land cooperative program significantly affects land transfer. However, to date, research has not explained the variance in the proportion of land dedicated to the CBLC across villages. Several studies argue that local elites should be excluded from rural restructuring programs because benefits may be unequally distributed in favor of elites (Platteau and Gaspart, 2003; Mansuri and Rao, 2004; Saito-Jensen et al., 2010). However, other studies find that elites can positively impact community-based development projects through their networks, knowledge, and resources (Fritzen, 2007; Balooni et al., 2010; Kyamusugulwa and Hilhorst, 2015).

In this paper, we examine the drivers of CBLC in rural China. In particular, we are interested in local elites' role in project implementation. The remainder of the paper is organized as follows. Section two describes the context of CBLC in rural China and develops a conceptual framework for analysis. Section three presents an overview of the data and analysis methods. Section four reports and discusses the main findings, and Section five concludes.

2.2 Project Description and Conceptual Framework

2.2.1 Description of the Land Cooperative Program

CBLC began as an experiment (Yep, 2015). The first CBLC project was founded in Nanhai City, Guangdong Province in the 1990s. In our research area, Jiangsu Province, the concept of CBLC was first applied in Suzhou City in 2002 and then rapidly spread across the province. By 2012, the total number of registered land cooperatives in Jiangsu Province reached 5,680. Various incentives are established to encourage participation. The *National Financial Support for Model Agricultural Cooperatives in China* (or *nong min he zuo she shi fan fu chi xiang mu* in Chinese) and *Opinions about the Implementation of Financial Support to Rural Land Transfer in Jiangsu Province* (or *Jiangsu sheng cai zheng fu chi nong cun tu di liu zhuan shi shi yi jian* in Chinese) were released in 2004 and 2008, respectively. These documents provide financial support for the development of CBLC. With the *Regulations of Jiangsu Province on Specialized Farmers Cooperatives* (2009), the program has entered the legal system. These regulations explicitly state that cooperative law applies to CBLC projects.

The CBLC projects consolidate farmland by merging scattered farmland. The cooperative either hires farm employees to cultivate the land or leases the land to the highest-bidding land user, including outsiders who have not resided in the village. Both households and agricultural companies are allowed to rent the land, although the latter rarely rent land in our study area. Land users must farm the land and cannot use it for other purposes.² Farm households become shareholders of the land cooperative and authorize the organization to manage their land. Typically, the organization gives members a fixed rent proportionate to the share of total land. In some cases, bonuses are paid contingent on the cooperative's performance. Exit from the program is regulated. If neither the land cooperative nor individual households wish to use land transferred to the

² Residential land may also be consolidated in some land cooperatives. In this study, we focus only on farmland.

program, the land is returned to its original users. If only some households elect to quit, they are compensated with comparable plots. In practice, this situation rarely occurs, and we are aware of only one case in which land was returned after the program collapsed.

The program generally follows a participatory approach, and members vote on major decisions regarding CBLC projects (Ito et al., 2016). Furthermore, local elites, such as university graduates, village officials or government officials (Zhao and Develtere, 2010; Zhao, 2011), occupy leadership positions for these projects. In some regions, the village committee serves as the land cooperative's leadership team (Chen, 2015). Local elites are critical to the successful initiation of CBLC (Ji and Qian, 2010); however, elite control – elites' dominance in decision-making processes – may raise concerns about the fair distribution of benefits from economies of scale or lower transaction costs in land markets (Ito et al., 2016). The same concerns apply to government subsidies for large-scale farming. In some cases the government incentivizes village officials to include more households in the program, which may cause conflicts with households that have a comparative advantage in farming and do not wish to transfer their land to the program.

2.2.2 Land Cooperative Programs, Local Forces and Rural Elites

Although top-down policy implemented to advance large-scale farming is a major driver of land consolidation in China (Long, 2014), a main characteristic of CBLC is the integration of bottom-up elements. Long et al. (2012) argue that bottom-up elements may prevent rural protests and that by involving the locals, land consolidation programs may increase the effectiveness of public policy through the creation of incentives and opportunities for negotiation (Haldrup, 2015).

The interaction between macro-level institutions and local factors provides a useful theoretical approach to understanding rural restructuring projects (Terluin, 2003; Long, 2014). Figure 2.1 presents a conceptual framework for analyzing potential drivers of the variation in policy implementation. In this conceptual framework, actors negotiate and

interact with each other within the contexts of macro-level institutions and local factors to reach an agreement, which in turn affects changes in land tenure, household livelihoods, and agricultural production in the villages.

Institutions shape economic activities by providing incentives, defining property rights, and enabling or restricting actors' actions (Bromley, 1989). Policies on CBLC change the choice sets and the associated costs and benefits for farm households and project leaders, affecting the amount of farmland dedicated to CBLC projects. Laws, regulations, and public policies can increase farm households' rate of participation in the projects by offering an adequate legal framework in which new organizations are founded and land property rights become more secure (Deng et al., 2010; Ito et al., 2016). Various policy instruments affect cooperative programs in China (Deng et al., 2010). In CBLC, a technique that has been particularly successful is providing households that transfer their land with a financial subsidy (Ito et al., 2016). Evaluations of local cadres' performance in the political hierarchy also contribute to the achievement of public policy targets (Edin, 2003), and successful cadres may receive annual bonuses or may be promoted to local officials (Birney, 2014).

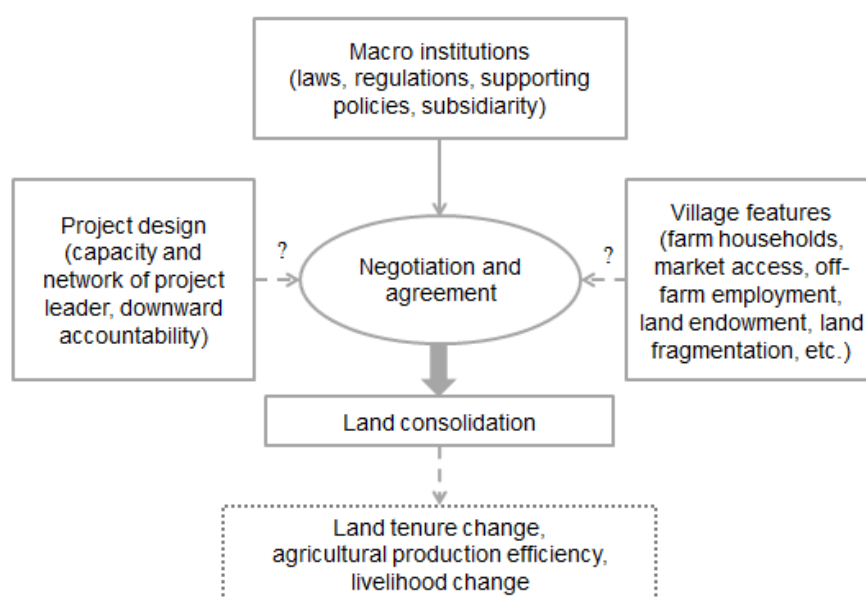


Figure 2.1 Drivers of Spatial Variation in Implementation of the Community-based Land Consolidation

Local forces also play an important role in project success (Terluin, 2003; Koontz, 2005;

Tavares et al., 2014). Market access, local off-farm economic activities, natural resource endowment, and the capacity of local actors and their networks are key drivers of project success. Market access impacts farm households' decisions regarding whether to participate in CBLC. Good access to markets creates opportunities for households to leave local collective initiatives (Willy and Holm-Müller, 2013) and increases the value of land by reducing transportation cost (Osabuohien, 2014). Land that is closer to the town has a higher value because land tenure may shift to urban uses (Chicoine, 1981), and this might prevent households from transferring land.

Local off-farm employment, land endowment, and the degree of land fragmentation are also important factors for the implementation of CBLC. The proportion of off-farm employment has altered households' production behavior (Liu et al., 2013) and the allocation of land. Chen (2011) shows that CBLC is particularly successful under conditions of well-developed off-farm employment. Accordingly, several studies show that off-farm employment opportunities significantly impact farmers' decisions to rent out land (Yao, 2000; Tan et al., 2006). Johannes (2002) observes that resource scarcity influences community-based resource management. The degree of land fragmentation that land consolidation projects aim to address (Long, 2014; Jiang et al., 2015) is also an important factor in the process of implementing CBLC.

Project design and the role of local elites may also affect the implementation of CBLC (Fritzen, 2007). Local elites can be generally defined as influential people who have substantial power due to their high levels of human capital, social networks, and natural resource endowments (Platteau, 2004; Dasgupta and Beard, 2007). Local elites often control the decision-making process in community-based development projects due to the power that they hold over others.

Several studies find that local elites involved in community-based development projects lack downward accountability and might defalcate project funds by falsifying accounts or over-reporting invoices (Platteau, 2004; Iversen et al., 2006). The literature typically

labels the unequal distribution of project benefits as “elite capture” (Dasgupta and Beard, 2007; Lund, 2015). Other studies find that all participants can benefit even when local elites disproportionately benefit (Fritzen, 2007; Balooni et al., 2010). Examining the land consolidation project in China, Long (2014) observes that project leaders, who are primarily rural elites, can strengthen the cohesiveness of villages to implement the project. A study conducted by Dasgupta and Beard (2007) also indicates that relative to projects in which power is evenly distributed, projects controlled by local elites succeed in delivering benefits to the targeted poor. Taken together, these studies suggest that local elites are able to use their knowledge, expert skills, and social and political networks to increase local participation in collective action (Balooni et al., 2010), even in the presence of elite capture.

In CBLC, three types of rural elites can be identified: (1) people with higher education, (2) village officials, and (3) government officials. Marvel and Lumpkin (2007) argue that education increases a person’s information and skills, including those needed to successfully recognize and pursue business opportunities. A good education also influences access to local information, which might have a positive impact on an individual’s ability to coordinate collective natural resource management (Pretty, 2003). A higher educational level has also been shown to positively affect organizational performance more generally (Bates, 1990; Gimeno et al., 1997). In CBLC, education may be particularly valuable in terms of helping individuals discover business opportunities, such as contracting with potential land users³.

Most leaders of CBLC projects are village officials with good access to local information and high levels of social capital within the community. However, village officials may also wish to avoid conflicts with other villagers during project implementation, especially

³ Further research might also explore the impact of land users, i.e., individuals and corporations that rent the land, on project success.

when other villagers are reluctant to participate. Evidence from the Philippines suggests that village officials' preferences are aligned with the preferences of households in the middle quartiles of the village asset distribution (Labonne and Chase, 2009). This finding indicates that to ensure successful reelections in the future, village officials may not promote projects that are not supported by the majority in the village. In the Chinese case, village officials are elected by the local population but paid by the government (Oi, 1995; Landry, 2008). Thus, their roles in CBLC are more complex. At the beginning of a project, leaders' preferences might be aligned with those of members of their community. Later, leaders may promote CBLC projects due to political pressure and their recognition of the project's potential economic benefits.

A few leaders of CBLC projects are government officials with political connections. From the perspective of rent-seeking, when project leaders have political connections, the project or its leader is more likely to receive financial support from the government (Caeyers and Dercon, 2012). Such financial support has been identified as a key factor in the development of cooperative organizations (Ito et al., 2016). Hence, a positive relationship between the appointment of a government official as the project leader and project coverage is expected.

2.3 Data and Empirical Strategy

2.3.1 Study Area, Sampling, and Data

Our study area comprises five counties – Kunshan, Zhangjiagang, Jiangdu, Gaoyou and Baoying – in Suzhou and Yangzhou City.⁴ The two cities differ economically. In 2013, the per capita gross domestic product was 123,209 RMB Yuan in Suzhou City and 72,775 RMB Yuan in Yangzhou City. Despite these differences, the two cities have the highest number of registered CBLC projects in Jiangsu Province. By the end of 2012, there were

⁴ The administration in China is organized hierarchically as follows: states, provinces, cities, counties, and towns.

483 land cooperatives in Suzhou and 1,063 in Yangzhou City. These programs are primarily located in the five selected counties. Figure 2.2 shows the location of the study area.

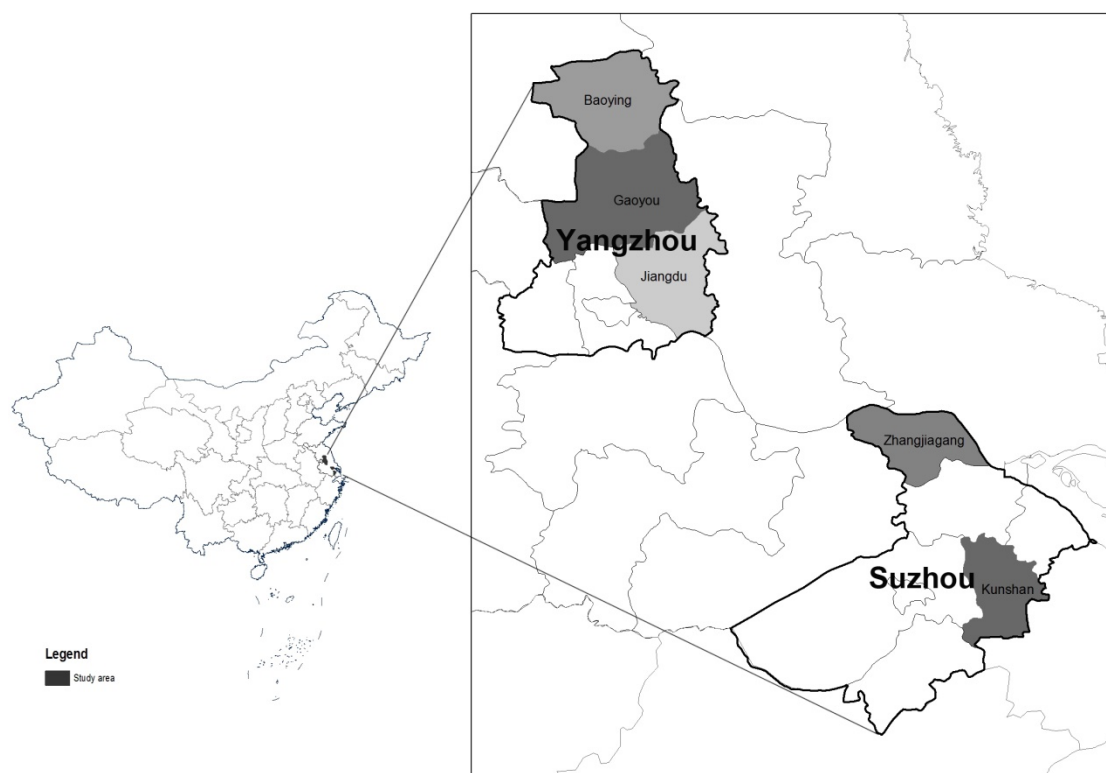


Figure 2.2 Study Area Location

The two cities also differ in their political support for CBLC. Kunshan and Zhangjiagang County, which are located in Suzhou City, provide a subsidy of 400 RMB Yuan and 300 RMB Yuan per mu⁵, respectively, to households whose farmland is utilized in the CBLC; this subsidy is in addition to the rent received from the organization. Although these payments alone are not sufficient to sustain a household's livelihood, they constitute a considerable supplement to other income sources.

A nested sampling strategy was used to draw the sample. We first randomly selected

⁵ RMB Yuan is the currency used in China. One Euro equaled approximately 7.5 RMB Yuan at the time that the research was conducted. Furthermore, 15 mu equal one hectare.

towns and then randomly selected sample villages with land cooperative programs in these towns.⁶ The selection process was conducted prior to the main fieldwork and was based on a list of all land cooperative projects registered in Jiangsu Province by the end of 2012. The final sample consisted of 120 villages of the 1,546 total villages with CBLC in Yangzhou City and Suzhou City.

A village-level interview was conducted to obtain information on each village. In addition, a program-level interview was conducted. The main respondents were village accountants and project accountants who were able to provide information about structural aspects of the village and the state of the cooperative project. Data collection in a village lasted approximately two hours, on average. To ensure accuracy and discourage misreporting, we referenced official reporting forms submitted to the government during the interview. The structured questionnaires contained several modules. At the village level, information was gathered on village land endowment, social-economic conditions, policies and institutional arrangements related to CBLC. At the program level, information was gathered on the amount of land in the cooperative, the organization's use of land, and cooperative leaders' socioeconomic backgrounds.

2.3.2 Empirical Model

Different types of methods are available to answer different types of research questions. Yin (2013) develops a heuristic of applicable research methods. A method is selected based on three factors: (1) the form of the research question, (2) the need to control for behavioral events, and (3) the temporal focus of the study. In this research, we are interested in estimating the size of effects, do not need to control for behavioral events, and are interested in contemporary events. Consequently, we employ a quantitative

⁶ Towns were selected in proportion to the number of cooperatives. In each town, six villages were selected. The sample was drawn using the random number generator in Excel.

survey with a structured questionnaire (Yin, 2013).

We use the total area of farmland consolidated and transferred through the land cooperative divided by the total farmland in one village as the main dependent variable throughout this paper. The proportion of land under cooperative management can take values between 0 and 100. We estimate the following equation:

$$Y_i = \alpha + \beta X_i + \gamma Z_i + e_i \quad (1)$$

where Y_i is the proportion of land under cooperative management in village i , X_i captures a set of the project leader's characteristics, and Z_i is a matrix of village-specific factors in village i . The α , β , and γ are parameters that are estimated, and e_i is an error term assumed to be independent and identically distributed. X_i consists of dummy variables indicating whether a project leader is a university graduate, a village official, or a government official. Because land consolidation and some village social-economic characteristics may have mutual impacts, the values for village characteristics are from the year directly before the project was implemented in the village. Accordingly, we add a project duration variable to capture the time effect. A dummy variable for the city (Suzhou) is also included to control for the effect of differences in cities (e.g., the different financing policies in Suzhou City and Yangzhou City).

When a dependent variable is continuous, ordinary least squares (OLS) regression is the most commonly used method. However, when one or two ends of the data are censored, the OLS estimator may produce out-of-interval predictions and biased estimates. The data are censored at 0 on the left and at 100 at the right. A Tobit model might be more appropriate in this case. Here, we present results from both models to determine the robustness of the estimates.

The dynamic change in the effect of elite control over time is also of interest. To explore this effect, we add an interaction term between elite characteristics and project duration to equation (1). The model then becomes:

$$Y_i = \alpha + \beta X_i + \gamma Z_i + \phi Duration_i + \varphi X_i * Duration_i + e_i \quad (2)$$

where $X_i * Duration_i$ represents the interaction between a project leader's characteristics and project duration in village i . Positive coefficients indicate that the effect of elite control increases over time.

2.3.3 Variable Definition and Expected Signs

Table 2.1 defines the variables and the expected sign of the coefficient estimates. Our dependent variable is the proportion of farmland transferred through the CBLC at the end of 2013. The main independent variables of interest are those that identify leaders' position, such as education, village official and government official. As demonstrated before, positive effect is expected.

Table 2.1 Definition of Variables

Variables	Description	Expected sign
<i>Proportion</i>	Proportion of farmland in a village dedicated to CBLC at the end of 2013	
<i>Dist_town</i>	Distance to town government (km)	+
<i>Off_farm</i>	Percentage of households in a village that participated or partially participated in the off-farm employment market before the project began (%)	+
<i>Landholding</i>	Average household landholding before the project began (mu per household)	-
<i>Plot_No.</i>	Average number of land plots per household before the project began	+
<i>Evaluation</i>	Is the scale of the CBLC related to village leaders' performance evaluation? (1 = yes; 0 = no)	+
<i>Duration</i>	Project duration as of 2013 (years)	-
<i>Suzhou</i>	The city in which the village is located (1 = Suzhou; 0 = Yangzhou)	+
<i>Education</i>	Is the project leader a university graduate? (1 = yes; 0 = no)	+
<i>Official_vill</i>	Is the project leader a village official? (1 = yes; 0 = no)	+
<i>Official_gov</i>	Is the project leader a government official? (1 = yes; 0 = no)	+

Source: Authors' own design

Independent variables and the expected direction of the relationship are derived from the framework presented in Section two. We use the distance between the village and the

town government (*Dist_town*) to capture the effect of market access, and a positive sign is expected. The effect of rural-urban labor migration is captured by the percentage of households that purely or partially worked in the off-farm sector in villages before the program was initiated (*Off_farm*). We expect a positive effect because an increase in off-farm employment in villages can drive the demand for land consolidation (Vranken and Swinnen, 2006; Siciliano, 2012). We use average household landholding before CBLC was implemented in villages (*Landholding*) to indicate resource scarcity and expect its sign to be negative (Johannes, 2002). The average number of land plots per household before CBLC was initiated in villages (*Plot_No*) is used to indicate land fragmentation (Hartvigsen, 2014), and we expect a positive sign.

Table 2.2 Summary Statistics

Variables	Obs.	Mean	S.D.	Min	Max
Dependent variable					
<i>Coverage</i>	120	50.78	38.12	0	100
Control variables					
<i>Dist_town</i>	120	6.20	4.51	0	25
<i>Off_farm</i>	120	81.95	25.51	0	100
<i>Landholding</i>	120	4.08	2.31	0.27	10.67
<i>Plot_No.</i>	120	2.71	1.38	1	10
<i>Evaluation</i>	120	0.18	0.38	0	1
<i>Duration</i>	120	3.93	1.68	1	8
<i>Suzhou</i>	120	0.35	0.48	0	1
Leader variables					
<i>Education</i>	120	0.47	0.50	0	1
<i>Official_vill</i>	120	0.90	0.30	0	1
<i>Official_gov</i>	120	0.08	0.28	0	1

Source: Authors' computations

To investigate the impact of institutions, we include a binary variable of village leaders' performance evaluation (*Evaluation*) and expect a positive sign. We use the city dummy (*Suzhou*) to control for other institutional factors, e.g., financial support for CBLC in Suzhou. We also control for program duration (*Duration*), which may have a positive

impact on program outcomes, because as the duration of a program increases, the amount of land involved in the project should increase.

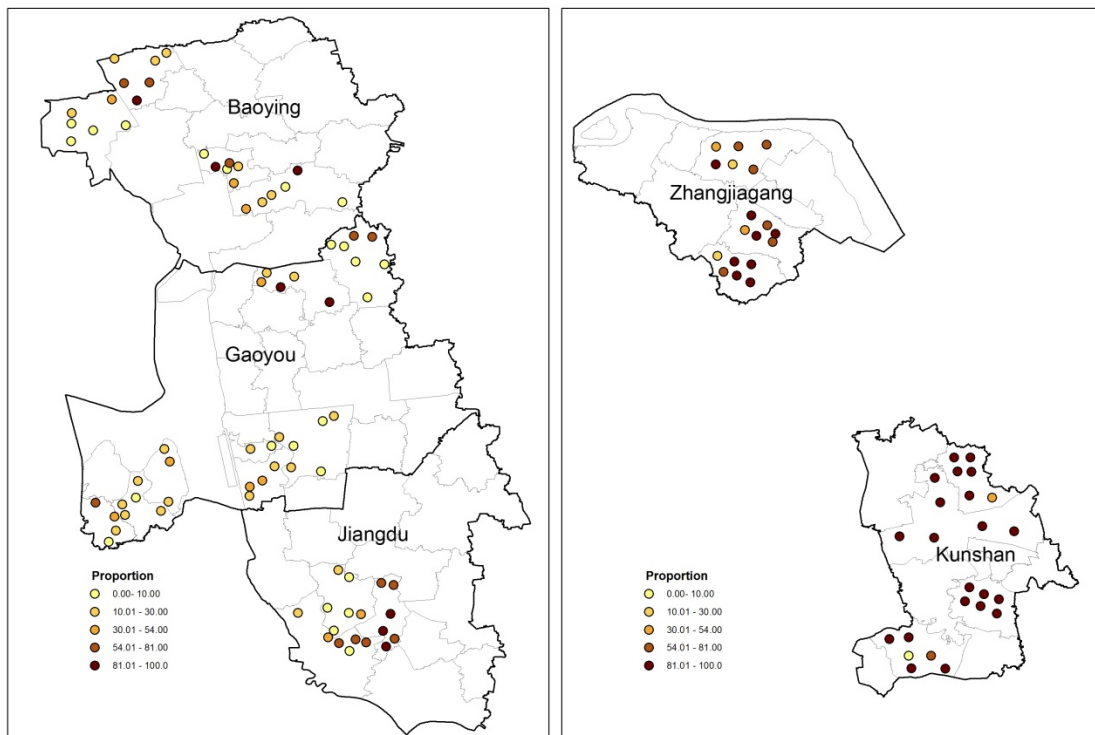


Figure 2.3 The Distribution of the Proportion of Agricultural Land in Villages Dedicated to the Program

Table 2.2 reports summary statistics for the variables used in the regression models. The minimum observed value of coverage is 0, indicating that no farmland was transacted through the project in the year of 2013. The maximum value of coverage is 100, demonstrating that in some villages, all the farmland was transacted through the project. The average proportion of project coverage in the samples is 50.78 (See Figure 2.3 the distribution of the proportion of land in different villages dedicated to the program). Table 2.2 also reveals that 47% of the project leaders are university graduates, 90% are village officials, and 8% are government officials.

2.4 Results and Discussion

2.4.1 Primary Results

Table 2.3 reports the results of the linear (OLS) regression of equation (1). All models use

robust standard errors. Column (1) presents a baseline model that includes village factors, project duration, and the city dummy. In columns (2) through (4), we add each of the variables representing the elites' characteristics to the baseline model. A model including all three of these variables is presented in column (5) to isolate the effect of each type of elite because a project leader may have two or three of the elite characteristics defined in our paper.

All models perform well in terms of R^2 and F-statistics. The overall explanatory power of the models is high. No problems with multicollinearity are found, as indicated by low variance inflation factors (available from the authors upon request), and residuals are normally distributed. Model (5) shows that five values exceed 100 and that none of the values are negative. These results indicate that the censored dependent variable is not problematic. In spite of this finding, we estimate a number of Tobit models, which show that the coefficients do not change substantially from the OLS estimates (See Table A 2- 1 in the appendix). In Table A 2- 2, we report the results of the OLS regressions after log transformation. As shown, no significant change in the signs or levels of statistical significance is evident for the variables.

Regional heterogeneity may raise the concern that the data cannot be pooled across the two cities. We regressed a version of equation (1) that adds interaction terms between all explanatory variables and the city dummy (Liu and Henningsen, 2016). A Chow test shows that we cannot reject the null hypothesis of zero coefficients for all interaction terms, indicating that the data can be pooled across cities. Some respondents reported very high or low values for *Off_farm* and *Plot_No* (Table 2.2). These values occur because official data are not available and, thus, we rely on respondents' reports. Although it is unreasonable to expect that a village's households have, on average, only one plot or that all households have a member participating in off-farm labor, we have no reason to believe that the general tendency of these values is incorrect or biased. As a robustness check, Table A 2- 3 re-estimates the model based on a sample that excludes extreme values. This change in the sample does not change the main results.

Table 2.3 Results of OLS Regression

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Dist_town	1.866*** (0.504)	1.848*** (0.504)	1.833*** (0.502)	1.681*** (0.462)	1.639*** (0.453)
Off_farm	0.266*** (0.098)	0.260*** (0.099)	0.265*** (0.097)	0.234** (0.097)	0.231** (0.096)
Landholding	-4.101*** (1.442)	-3.992*** (1.465)	-4.122*** (1.407)	-3.947*** (1.431)	-3.906*** (1.420)
Plot_no.	1.780 (1.699)	1.860 (1.659)	1.955 (1.759)	1.947 (1.676)	2.167 (1.719)
Evaluation	16.643** (7.218)	16.446** (7.288)	16.359** (7.096)	16.155** (6.974)	15.760** (6.934)
Duration	-2.034 (1.585)	-1.946 (1.613)	-1.881 (1.557)	-2.201 (1.535)	-1.994 (1.540)
Suzhou	33.487*** (8.017)	32.075*** (8.383)	32.450*** (7.946)	33.504*** (8.053)	31.644*** (8.345)
Education		3.892 (5.938)			2.263 (5.977)
Official_vill			8.831 (7.850)		8.850 (7.994)
Official_gov				18.735** (7.994)	18.552** (7.776)
Constant	22.695* (12.658)	20.965 (13.590)	14.423 (14.674)	24.551** (12.224)	15.237 (15.089)
F	29.552	26.035	25.510	26.095	20.638
Adjusted R ²	0.487	0.485	0.487	0.501	0.498
Observations	120	120	120	120	120

Source: Authors' computations; Notes: Robust standard errors are presented in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.10.

Table 2.3 shows that the estimated effect of the project leaders' educational level is positive. Projects led by university graduates transfer more farmland to the CBLC; this result is consistent with our expectation. However, the effect is statistically non-significant at the ten percent level. One may argue that an increase in actual knowledge and skills depends not only on years of schooling and formal levels of

education but also on other skills that cannot be easily measured. For example, a manager with a good general education in a non-business field may not be able to contribute to organizational performance (Unger et al., 2011; Ganotakis, 2012).

Village officials who are cooperative leaders can positively impact the share of land under cooperative management. However, this effect is not statistically significantly different from zero. Evidence from Indonesia shows that elected village officials may, to some extent, have preferences consistent with those of the majority of community members (Labonne and Chase, 2009). Therefore, village officials may not exert much effort to implement an experimental reform (Yep, 2015) that may elicit conflicts among skeptical farmers.

In line with our expectation, the effect of the appointment of a government official as the project leader is positive. The effect is large and significantly different from zero at the five percent level. Specifically, a government official in the leadership position increases the proportion of land under cooperative management by approximately 20 percent. Cooperative leaders who are well connected to governments may more easily access subsidies and other support. This explanation is in line with the results of a previous study, which showed that the daily relationship between cooperative leaders and local governments is the most important determinant of whether cooperatives receive national financial support (Zhao, 2015).

In line with our expectation, distance to the town center as a measure of market access has a statistically significant and positive impact on the area under cooperative management. An increase in the distance to the town center by one kilometer increases the share of land under cooperative management by 1.5%. The percentage of households that participated in off-farm employment has a positive sign, as expected. Villages in which off-farm employment prevails are more likely to have larger areas under cooperative management,

consistent with earlier findings that off-farm employment can facilitate land markets (Tan et al., 2006; Huang et al., 2012)⁷. According to the coefficient estimates in column (5), a one-unit increase in the proportion of households in the off-farm employment market may trigger a rise in the relative amount of farmland involved in the CBLC by 0.231%.

The effect of the average household landholding is negative and significantly different from zero. A one-unit increase in the average household landholding decreases the project's coverage of farmland by approximately four percent. An intuitive explanation is that a low average endowment of farmland might represent an inefficient scale of production; this might be resolved by pooling the land in cooperatives. Similarly, Johannes (2002) observes that resource scarcity increases the likelihood that collective natural resource management is implemented.

The average number of land plots per household shows the expected positive sign, suggesting that villages with more fragmented land can draw more farmland to CBLC because land fragmentation is a key driver of the start and development of consolidation projects (Long, 2014; Jiang et al., 2015). However, this effect is not significantly different from zero, casting some doubt on the aim of addressing land fragmentation through CBLC. Similarly, we do not find a significant impact of program duration on the proportion of land dedicated to the program.

The city dummy is positive and significant, suggesting that villages in Suzhou City are more likely to draw farmland to CBLC. CBLC projects in Suzhou City cover a proportion of land that is 31.09% larger, on average, than that covered by projects in Yangzhou City. Although, in principle, many factors could drive this result, one important factor might be

⁷ For the variables *Dist_town* and *Off_farm*, one may suspect that people living closer to the city are also more likely to be employed in the off-farm sector. Thus, we calculate the Pearson correlation coefficient ($r = -0.137$). The correlation is small and statistically not significantly different from zero. One explanation for this lack of correlation is that most villages are located relatively close to the city, as the highest recorded distance in our sample is 25 kilometers (see Table 2.2).

differences in local financial support. Indeed, Ito et al. (2016) find that subsidies from the local government can significantly improve the ratio of consolidated land.

2.4.2 Further Investigation of the Effect of Elite Control

To investigate the effect of changes in elites' control over time, we add the interaction between project duration and project leaders' characteristics. Table 2.4 reports the results of OLS regressions that take into account the interaction between elite control and project duration.

Table 2.4 Results of OLS Regressions Including Interaction Effect

Variables	Model 1	Model 2	Model 3
Dist_town	1.584*** (0.458)	1.657*** (0.456)	1.644*** (0.457)
Off_farm	0.190** (0.095)	0.232** (0.095)	0.232** (0.098)
Landholding	-4.368*** (1.398)	-4.538*** (1.441)	-3.917*** (1.422)
Plot_no.	2.180 (1.656)	2.224 (1.759)	2.121 (1.749)
Evaluation	15.412** (6.694)	16.442** (6.725)	15.889** (6.954)
Suzhou	31.828*** (8.287)	28.921*** (8.502)	31.359*** (8.558)
Duration	-4.721*** (1.779)	-7.380*** (2.404)	-1.862 (1.667)
Education	-23.671** (11.342)	1.384 (5.871)	2.370 (6.036)
Official_vill	6.138 (7.860)	-17.902 (13.160)	8.708 (8.011)
Official_gov	18.120** (7.237)	19.465*** (7.273)	23.808 (20.638)
Education×Duration	6.594** (2.769)		
Official_vill×Duration		6.472** (2.776)	
Official_gov×Duration			-1.241

			(4.843)
Constant	34.033*	41.158**	14.881
	(17.274)	(17.127)	(15.428)
F	20.337	20.616	18.683
Adjusted R ²	0.514	0.505	0.494
Observations	120	120	120

Source: Authors' computations

Notes: Robust standard errors are presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The interaction between education and project duration is positive and significant, implying that projects led by university graduates draw a larger proportion of farmland to the project over time. Learning processes could explain this finding. New businesses are more likely to fail if they are controlled by new businesses' managers because such managers have the least specific knowledge and skills at the starting point (Bates, 1990). Over time, educated project leaders learn more quickly, helping them to better manage farmland.

The interaction between village officials and project duration is also positive and significant at the 5% level, suggesting that projects led by village officials draw more farmland to the project, particularly when the project runs for a longer time period. In community-based projects, the relationship between elites and non-elites may change over time due to the general acceptance and legitimacy of the aim of the proposed project and the recognition of their preferences (Lund and Saito-Jensen, 2013). In the case of CBLC, a higher degree of legal stability and the perception of potential project benefits over time may encourage village officials to include more farmland.

The interaction between government officials and project duration becomes non-significant, indicating that the advantage that government officials enjoy does not substantially change over time. This result is intuitive considering that national and provincial financial support can be granted only once. Government officials may take advantage of their political networks to receive financial funding from the government only once, especially in the early years. However, in later years, project performance may

remain constant or even drop when support fails. In other words, implementing a project with government officials as project leaders may pay off at first but does not result in larger long-term benefits.

2.4.3 General Discussion

In the estimated models, the appointment of a government official as the project leader has a large and significant effect on project success, and this effect might be explained by the leader's ability to access social networks.⁸ According to the cooperative law, participation in CBLC projects should be voluntary. In the vast majority of cases, project leaders do not place disproportionate pressure on farmers to join CBLC projects. During the pre-survey portion of the fieldwork, we encountered one case in which a farmer's plants were cut down to force him into the CBLC project. However, such cases are rare. In a few cases, farmers lose access to irrigation due to CBLC projects. Typically, irrigation is organized collectively by the village committee. If many farmers join the CBLC project and the pooled land is rented to large-scale investors, the village committee might stop the supply of irrigation water to dispersed farmers who did not contribute their land. Although project leaders do not exert pressure on these farmers in these cases, affected farmers are placed at a disadvantage.

One objective of the CBLC project is to reduce land fragmentation. Thus, one might expect that a high degree of land fragmentation is an important driver of project success. However, we do not find a large effect of land fragmentation. The consolidation of fragmented land to increase agricultural productivity is a crucial problem not only for China but also for other economies in transition. Van Huylenbroeck et al. (1996) propose an evaluation tool that can be used to compare consolidation successes and failures across

⁸ In our regression, we do not specifically consider social capital. An in-depth analysis based on the network theory of social capital requires a different method and a more detailed analysis (Balooni et al., 2010). Thus, we do not perform an analysis of informal social networks or clearly distinguish between bridging and bonding types of social capital because such analysis requires a more detailed conceptual model and definition (Paldam, 2000; Woolcock and Narayan, 2000). In the Chinese context, the consideration of the concept of *guanxi* also calls for a more elaborate treatment of informal networks (Yan, 1996).

countries, but the simple replication of policies from countries with long-lasting land consolidation practices can have negative effects due to fundamental incompatibility with the institutional environment and structural peculiarities (van Dijk, 2007; Djanibekov et al., 2012). The case of Albania highlights this point. Policies designed to tackle the consolidation of fragmented land are in place; however, land transfer is impaired by inefficient land markets (Deininger et al., 2012). Although land consolidation cooperatives might be an effective instrument for successful rural restructuring in other contexts, in China, the peculiar role of elites and the specific institutional environment should be considered before general conclusions are drawn from our results.

2.5 Conclusions

In China, CBLC is an essential part of rural restructuring to improve the efficiency of agricultural production. This study examined the effect of local forces on the implementation of the CBLC program, as measured by the proportion of agricultural land transferred through the program. Our conceptual model distinguished village features, macro institutions, and project design as drivers of land consolidation. All three dimensions shape project outcomes.

We find that village features, such as distance to town and off-farm market participation significantly affect program outcomes. Unlike previous studies, and in contrast to the objectives of the land cooperatives program, we do not find that land fragmentation drives land consolidation. Governments that intend to develop community-based agricultural land consolidation programs therefore should prioritize villages that are far from the town center, have low levels of land endowment, and have high off-farm market participation.

We also show that the program develops more effectively when the scale of the program is part of the village leaders' performance evaluation system. In other words, projects must be designed in a way that holds village leaders accountable. Policymakers might consider extending leader evaluation programs in the future, while ensuring that leaders

do not abuse their power. We find substantial differences in land consolidation rates between the two cities we study. Arguably, macro institutions, i.e., the local legal framework, can positively impact land consolidation. Most notably, subsidies increase the attractiveness of land cooperatives.

Local elites who lead CBLC projects are able to promote the projects in some cases. This is particularly true for government officials, who have a large effect on the proportion of land under cooperative management. Interaction effects of different types of local elites and project duration suggest that the role of local elites changes over time. In the short term, government officials are successful. However, for long-run success, more educated people and village officials should be encouraged to lead the project. Our findings support recent studies' notion that local elites can be a blessing to local participation in community-based development programs. Based on these results, we argue that excluding the local elites from leadership positions in community-based development projects may come at a price.

Despite the positive role of local elites in promoting local participation, we do not suggest that elite control is harmless. Indeed, many studies highlight the presence of elite capture in community-based development programs. Regarding the CBLC program, we cannot rule out the possibility of elite capture. Further studies that examine the topic in greater depth are needed. However, governments should account for the role and interests of local elites when developing community-based development projects. Systems that minimize the potential negative effects of elite involvement while maintaining the positive effects are needed.

Acknowledgements

This research was supported by the National Natural Science Foundation of China (grant numbers 71322301 and 71173097), the Fundamental Research Funds for the Central Universities (grant numbers KJYQ201401 and SKZD201306), and the Specialized

Research Fund for the Doctoral Program of Higher Education of China (grant number 20130097110038). We are thankful for helpful comments from the guest editors of the special issue, four anonymous referees, and Markus Hanisch. Special thanks go to the China Scholarship Council for supporting this research project.

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3 EMPIRICAL STUDY II:

CAN LAND TRANSFER THROUGH LAND COOPERATIVES FOSTER OFF-FARM EMPLOYMENT IN CHINA?

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Published in: China Economic Review 45, pp. 35-44

DOI: 10.1016/j.chieco.2017.06.002

Abstract: Functioning land markets are necessary for an increase in off-farm employment. However, there is limited empirical evidence on the impact of land transfer on off-farm employment in rural China. This paper investigates the drivers of households' cooperative membership, which is equivalent to transferring land through land cooperatives, and its impact on off-farm employment. Using a two-step control function approach and data from Suzhou and Yangzhou (Jiangsu province), we do not find a general effect of cooperative membership on household heads' current off-farm employment, though the effect is large for households which had surplus agricultural labor before cooperative initiation. The effect is also positive and large for household heads without off-farm experience and households located in Yangzhou. Policy-makers should be aware of the distributional consequences of these heterogeneous effects.

Keywords: Land Market; Labor Market; Land Cooperative; Control Function; Jiangsu

3.1 Introduction

Off-farm employment helps to diversify and increase rural households' income (Atamanov and van den Berg, 2012). Because added value per worker is higher in the off-farm sector (Gollin et al., 2014), off-farm employment is an important source of household income contributing to poverty alleviation in rural areas. In addition, off-farm income provides cash for purchasing inputs to increase agricultural production (Matshe and Young, 2004). In recent years, developing countries such as Mexico (Valsecchi, 2014), Vietnam (Do and Iyer, 2008) and China (Groom et al., 2009; Uchida et al., 2009), have, thus, made an effort to facilitate a shift in labor employment from agriculture to off-farm sectors.

Rural land market development can facilitate off-farm employment (Mullan et al., 2011; Chernina et al., 2014). Because land and labor are complementary inputs in agricultural production (Hertel, 1989), a change in the employment of labor may typically go along with a change in the employment of land. Empirical evidence shows that farmers' land transfer decisions and off-farm employment decisions are closely interrelated (Feng and Heerink, 2008). However, it is important to further acknowledge this interrelation. Several studies have investigated the impact of off-farm employment on land market participation (Kung, 2002; Huang et al., 2012; Yan and Huo, 2016). However, only a few studies (Shi et al., 2007; Yan et al., 2014) have investigated the effect of land market participation on labor market participation in rural China, often ignoring the endogeneity of households' land transfer decisions.

In this paper, we investigate the effect of land transfer on off-farm employment, using data from the land cooperative program in China. This is the first attempt to consider the causal effect of land cooperative membership on off-farm employment. We employ a two-step control function approach to address the endogeneity of cooperative membership (Wooldridge, 2014). The rest of the paper is organized as follows. In section two we provide some background on the land cooperative program and demonstrate why cooperative membership may affect off-farm employment. In section

three, we describe the data and empirical strategy. In section four, we present and discuss the results, followed by a concluding section.

3.2 Institutional Background and Context

3.2.1 Land Cooperative Program

Rural land in China is governed under the household responsibility system. Farmers contract with village committees to use land for agricultural production. For political reasons, land cannot be privatized in China, but contracts give households rights to use land and transfer it in rental markets. However, the egalitarian principle and the redistribution of land in response to population change have led to land fragmentation and insecure property rights. High transaction costs hinder the development of an efficient land market (Jin and Deininger, 2009; Bao et al., 2015).

At the beginning of the 21st century, land and labor markets in rural China remain underdeveloped (Kung, 2002). According to the Agricultural Committee of the province, in 2006 in Jiangsu Province, one of the most developed regions in China, less than 10% of the agricultural land has ever been traded in the rental market. This figure is even higher than the national average (Ito et al., 2016). Despite the ongoing shift of labor from the agricultural to off-farm sectors, labor employment in agriculture in 2005 was still at approximately 45% (Deininger et al., 2014). This provides an opportunity to achieve greater economic efficiency by developing factor markets in rural areas (Zhang and Tan, 2007).

The land cooperative program was initiated to facilitate land transfer and to release rural labor (Lin and Ma, 2014; Chen, 2015). In the early 1990s, it was first applied in Nanhai, Guangdong Province. In different local variations the program is now viewed as an important part of a collective economy by the central government, and it spread widely across the coastal provinces (Tian and Zhu, 2013; Chen, 2015). Jiangsu is the only province which has legally implemented the program via the release of the *Regulations of Jiangsu Province on Specialized Farmers Cooperatives* in 2009. The program is also

implemented differently within the province. In Suzhou, for instance, the local government provides financial support to households who transfer land to the program. Similar support does not exist in other cities of the province. Such policy variation may indicate regional differences in the importance of the program.

Households that transfer land to the cooperative become its members and receive benefits in the form of stocks (Ito et al., 2016). The stocks issued by the cooperative make the households' land contract rights – the right to get a share of farmland in the village – independent from the direct use of land.⁹ Households then can transfer land to the cooperatives while retaining the right to benefit from the land. The stocks can be mortgaged, transferred, and inherited. Such institutional arrangements avoid the periodical land reallocation and secure households' land contracts right (Po, 2008; Ito et al., 2016).

The security of land contracts rights may encourage land transfer (Deininger et al., 2014). Because the land cooperative becomes the central contracting partner in a village, households have to deal with only one transacting partner which saves them costs of searching for and negotiating with others in the village (Bao et al., 2015). It is reported that between the start of the land cooperative program and 2013 approximately 50% of land has been traded in rental markets in Jiangsu (Ito et al., 2016).

3.2.2 Impact of Cooperative Membership on Off-farm Employment

We expect that households' cooperative membership, which is equivalent to transferring land through cooperatives, has a positive effect on households' off-farm employment. This results from the complementary nature of land and labor in agricultural production and the assumption of imperfect land markets in China. If the local land and labor markets were perfect, land and labor resources would have been efficiently allocated.

⁹ This is the major difference between the land cooperative program and the collectivization policy in the Maoist period when farmers were not free to choose how to use the land.

The emergence of land cooperatives would then have no effect on households' labor allocation.

However, it has been well recognized that land markets in rural China are imperfect (Kung, 2002; Deininger et al., 2014). Land fragmentation and insecure property rights have hindered the development of land rental markets (Bao et al., 2015; Ito et al., 2016). Consequently, a smaller amount of land had been traded and fewer farmers had engaged in the off-farm sector due to the risk of losing future benefits from land, i.e. the risk of land dispossession from land re-distribution (Kung, 2002). The emergence of land cooperatives, which secure households' future benefits from land, therefore provides households the opportunity to engage in the off-farm sector by transferring land to cooperatives.

The effect of cooperative membership on off-farm employment also depends on households' ability to access the labor market. Because the income gap between the farm and the off-farm sector often differs for heterogeneous households, they may choose different production strategies (Yao, 2000). Some would specialize in the off-farm sector if they had access to well-paid off-farm employment before cooperative initiation, which could surpass the risk of losing benefits from land. These households often used their land inefficiently when land markets were imperfect, for instance by giving it to kin relatives for free. Land cooperatives then provide them the opportunity to maximize benefits from land without an impact on labor allocation.

Others would focus on agriculture if potential off-farm employment available to them could not surpass the risk of losing future benefits from land due to insecure property rights. The restrictions from imperfect land markets on labor allocation are much stronger for these households. More agricultural labor would be constrained in agriculture. Because land cooperatives to some extent secure households' income from contract land, the effect of cooperative membership on these households' off-farm employment is expected to be larger.

3.3 Data and Empirical Strategy

3.3.1 Data Collection

The data were collected in 2014 in Suzhou and Yangzhou, Jiangsu Province, China. We chose the two cities because they were the first to develop the land cooperative program in the province. Compared to other cities in the province, they had the highest number of land cooperatives by the time of our survey. By the end of 2012, the number of land cooperatives in Suzhou and Yangzhou were 483 and 1063, respectively. The two cities are typical for the development of the land cooperative program rather than for the development of rural areas in China more generally. In 2013, the per capita gross domestic product in China was 41,908 RMB Yuan, while in Suzhou and Yangzhou these figures were much higher, with 123,209 RMB Yuan and 72,775 RMB Yuan, respectively.¹⁰ Dynamic economic growth led to labor migration especially of middle-aged farmers, leaving the elderly behind on the farms (Long et al., 2016). Such labor migration, however, has not resulted in large land transfers until the start of the land cooperative program (Ito et al., 2016).

We randomly selected 60 villages from a list of villages which had land cooperatives in the two cities. We did not include villages without land cooperatives to avoid a selection bias at the village level, because households from those villages cannot join the program. Data were collected at the village and household levels with the help of ten students from Nanjing Agricultural University. Students used the random walk technique to select households. Information was obtained on basic village characteristics, cooperative leadership, and household characteristics, using a structured questionnaire and face-to-face interviews. In total, our cross-sectional dataset consists of 545 observations at the household level.¹¹

¹⁰ Data are drawn from the China Statistical Yearbook (2014) and the Jiangsu Statistical Yearbook (2014).

¹¹ In total, 583 households from the 60 villages were interviewed. We exclude 38 households that have no land in the

3.3.2 Estimation Strategy

Because we are particularly interested in the interaction of land transfer and off-farm employment, we do not explicitly distinguish between local off-farm employment and distant off-farm employment (Shi et al., 2007). We focus on the off-farm employment of household heads who play a major role in the agricultural labor force (Long et al., 2016). We specify the following models to investigate the determinants of a household's land labor market decisions:

$$M^* = \alpha_1 X + \alpha_2 Z + \delta, \quad M = \begin{cases} 1, & \text{if } M^* \geq 0 \\ 0, & \text{otherwise} \end{cases}; \quad (1)$$

$$OF^* = \beta_1 X + \beta_2 M + \mu, \quad OF = \begin{cases} 1, & \text{if } OF^* \geq 0 \\ 0, & \text{otherwise} \end{cases}; \quad (2)$$

where M^* and OF^* are latent variables denoting the utility from cooperative membership and off-farm employment, respectively. M and OF are the observed binary variables measuring cooperative membership (= 1 if household is a member, = 0 otherwise) and off-farm employment (= 1 if household head has off-farm employment, = 0 otherwise), respectively. X is a set of exogenous factors that determine both decisions, and Z includes instrumental variables that only affect M . α_1 , α_2 and β_1 are coefficient vectors to be estimated. M is added in the off-farm employment Eq. (2) to estimate the causal effect of cooperative membership on off-farm employment β_2 . The δ and μ are error terms.

The causal effect of cooperative membership on off-farm employment can be identified by estimating a probit model if the error terms δ and μ are uncorrelated. However, if their covariance ρ is not equal to zero, β_2 is biased due to endogeneity, resulting from reverse causality or the simultaneity of both decisions. We include household heads' off-farm experience before the program to remedy reverse causality. A straightforward

village, because they are not qualified to join a land cooperative.

approach to address the simultaneity is to use a bivariate probit model (biprobit). The causal effect in the biprobit model is identified if Z significantly affects M , and if the two error terms follow a bivariate normal distribution (Greene, 2008). However, the biprobit model is often less efficient, and does not allow for interactions between endogenous regressors and exogenous covariates (Nichols, 2011), restricting its ability to detect heterogeneous treatment effects.

As an alternative, a two-step control function approach can be used (Wooldridge, 2014). In the first step, a probit model of the cooperative membership Eq. (1) is estimated with X and Z to obtain the generalized residuals R , which are defined as:

$$R = M\lambda(\alpha_1 X + \alpha_2 Z) - (1 - M)\lambda(-\alpha_1 X - \alpha_2 Z) \quad (3)$$

where $\lambda(\cdot)$ is the inverse Mills ratio. For the probit model, the generalized residuals are exactly the inverse Mills ratio (Lloyd-Smith et al., 2016). A Wald test over the joint significance of the instruments in Eq. (1) can be performed to test the strength of the instruments. In the second step, the obtained generalized residuals R are introduced as a regressor in the off-farm employment Eq. (2).

$$OF^* = \beta_1 X + \beta_2 M + \beta_3 R + \mu \quad (4)$$

A probit model of the off-farm employment Eq. (4) including the generalized residuals provides consistent estimates of the causal effect of cooperative membership on off-farm employment. The probit t -statistics on β_3 is sufficient to test the null hypothesis that membership is exogenous. We follow Abdulai et al. (2011) to test over-identification of instruments. Specifically, Eq. (4) is re-estimated with instruments included:

$$OF^* = \beta'_1 X + \beta'_2 M + \beta'_3 R + \beta'_4 Z + \mu \quad (5)$$

If β'_4 are jointly not different from zero, instruments Z can be excluded from Eq. (4). In the paper, we report the results from the control function. Results from the bivariate are provided in the appendix as a benchmark. To address possible correlation of errors, we cluster standard errors at the village level.

3.3.3 Variable Definition

We study a number of exogenous factors that could drive households' participation in land markets and off-farm employment. Table 3.1 describes the variables and presents summary statistics. We include household heads' age, gender and education in the model. A dummy to indicate household head's off-farm employment experience before cooperative initiation in the village is introduced. We expect a positive effect of this variable in both equations, because farmers with previous off-farm experience are more likely to transfer land and to keep their off-farm employment or to start new off-farm employment. We introduce land area per adult to capture household land endowment. Large land endowments are expected to increase households' probability of cooperative membership and to decrease households' probability of having off-farm employment, because more agricultural labor would be needed to farm more land.

The number of land plots households own is introduced to control the degree of land fragmentation. Fragmented land decreases the propensity of off-farm employment (Yan et al., 2014) while it increases the propensity to transfer land. Household labor availability also has an impact on household labor and land allocation. Family size and household dependency ratio represent household labor availability (Feng and Heerink, 2008). We define the ratio of the number of family members who are older than 65 years or younger than 15 years to the family size as household dependency ratio. A low wealth level may exclude farmers from land cooperatives and off-farm employment because the entry of off-farm employment may require a minimum level of assets (Atamanov and van den Berg, 2012). We use the number of main durable assets, such as houses and cars as an indicator of wealth (Feng and Heerink, 2008).

Social networks, i.e. political and labor networks, help households to access job market information or to seize opportunities for employment (Yao, 1999; Kung and Lee, 2001). Earlier studies find that having a political cadre in the family (Zhang and Li, 2003; Zhang et al., 2012) or the more number of early migrators (Zhao, 2003) increase the

family members' off-farm employment. We use communist party membership and the number of other family members who worked off-farm as proxies for social networks. In addition, social networks may increase households' access to policy and drive them to participate in land cooperatives. Distance to town and a city dummy are introduced to control for location effects. Earlier studies show that village location is important to the amount of land dedicated to land cooperatives (Liu et al., 2016) and households' off-farm employment (Jonasson and Helfand, 2010).

Table 3.1 Variable Description and Summary Statistics (N = 545)

Variable	Description	Mean	S.D.
Dependent Variables			
Off-farm employment	= 1 if the household head has off-farm employment; 0 = otherwise	0.626	-
Membership	= 1 if the household is a cooperative member; 0 = otherwise	0.703	-
Independent variables			
Household head age	Age of the household head (years)	61.01	10.19
Male household head	= 1 if the household head is male; 0 = otherwise	0.96	-
Household head education	Years of schooling of the household head (years)	7.024	3.355
Household head off-farm experience	= 1 if the household head had off-farm employment before the program; 0 = otherwise	0.626	-
Land area per adult	Area of land per adult (over 15 years old) in Mu	1.298	0.821
Number of land plots	Number of land plots the household owns	2.081	1.333
Family size	Number of family members	3.936	1.575
Dependency ratio	The number aged over 65 or below 15 divided by family size	0.349	0.314
Asset level	The number of houses or cars the household owns	1.741	0.904
Party membership	= 1 if the household has communist party member(s); 0 = otherwise	0.314	-
Labor network	Number of other family members with off-farm employment before cooperative initiation	1.440	1.112
Distance to town	Distance to town (km)	6.542	4.522

Average household landholding	Average household landholding in the village (Mu)	3.307	2.073
Average plot number per household	Average plot number per household in the village before cooperative initiation (mu)	2.853	1.327
Time since cooperative initiation	Time since cooperative initiation (years)	4.018	1.713
Village cadre as cooperative leader	= 1 if the cooperative director is a village cadre; 0 = otherwise	0.914	-
Suzhou	= 1 if the household is from Suzhou; 0 = otherwise	0.639	-

Source: Authors' computation

We introduce four village level variables as potential instruments of cooperative membership, namely a village's average number of plots per household, a village's average landholding per household, the time since the start of the cooperative, and a dummy variable indicating if the cooperative leader is a village cadre. These variables should have no direct effect on individuals' off-farm employment. Liu et al. (2016) show that a low average land endowment in a village, high land fragmentation, and strong cooperative leadership can explain the relative amount of land transferred to cooperatives at the village level. The longer the cooperative exists in the village, the more likely households participate.

To increase the power of instruments, we introduce the average level of participation in a village as an additional instrument. It is defined as the mean of the other households' participation in the same village and assumed to correlate with individuals' participation, because many people are conditional cooperators, i.e., they cooperate if others do (Fischbacher et al., 2001; Frey and Meier, 2004). Because lands in cooperatives are restricted for agricultural use and no new off-farm opportunity will be created on them, average participation should not directly affect individuals' off-farm employment. The use of village means of the endogenous variables as instruments has also been used in other studies (Kung, 2002; Rao et al., 2017).

3.4 Results

In this section, we first present the results for the full sample. Then, we discuss potential heterogeneity in the effects of cooperative membership by estimating models for different subgroups of the sample.

3.4.1 Results for the Full Sample

Table 3.2 shows household heads' off-farm employment, disaggregated by cooperative membership. In the sample, 383 households (= 70.3%) participate in land cooperatives, whereas 162 households (= 29.7%) do not participate. 341 household heads (= 62.6%) have off-farm employment, in contrast to 204 (= 37.4%) that do not. The proportion of household heads with off-farm employment in households with cooperative membership (265 out of 383) is much higher than that of households without cooperative membership (76 out of 162), implying some interdependence of off-farm employment and land transfer to land cooperatives.

Table 3.2 Frequency of Cooperative Membership and Off-farm Employment

Off-farm employment	Cooperative membership		
	No	Yes	Total
No	86	118	204
Yes	76	265	341
Total	162	383	545

Source: Authors' computation

Table 3.3 presents the main estimation results. Although only the average participation level is individually statistically significant, the F -statistic for the test of the joint significance of instruments suggests that they can explain cooperative membership. The F -statistic for the test of overidentification fails to reject the exclusion restriction that the instruments affect off-farm employment only via cooperative membership. The generalized residual shows no statistical significance, indicating no simultaneity bias, i.e., estimates are consistent (Abdulai et al., 2011).

Table 3.3 Determinants of Cooperative Membership and Off-farm Employment (Full Sample)

Variables	Membership		Off-farm	
Membership			0.103	(0.073)
Household head age	-0.000	(0.002)	-0.010***	(0.002)
Male household head	-0.032	(0.077)	0.166	(0.116)
Household head education	0.006	(0.004)	0.000	(0.004)
Household head off-farm experience	0.054**	(0.027)	0.346***	(0.017)
Land area per adult	0.070***	(0.025)	0.009	(0.022)
Number of land plots	0.018	(0.017)	0.011	(0.013)
Family size	0.012	(0.012)	0.016	(0.011)
Dependency ratio	-0.013	(0.051)	-0.048	(0.057)
Asset level	-0.003	(0.018)	0.016	(0.015)
Party membership	0.045	(0.030)	0.074**	(0.032)
Labor network	-0.005	(0.018)	-0.015	(0.021)
Distance to town	0.003*	(0.002)	0.002	(0.003)
Suzhou	0.103***	(0.039)	0.066	(0.054)
Average plot number per household	0.002	(0.008)		
Average household landholding	-0.004	(0.007)		
Time since cooperative initiation	0.001	(0.004)		
Village cadre as cooperative leader	0.041	(0.025)		
Group average of participation	0.499***	(0.036)		
Generalized residuals			-0.039	(0.051)
Pseudo R ²	0.449		0.437	
Observations	545		545	

Notes:

- The table reports average marginal effects. Delta method standard errors are in the parentheses.
- The *F*-statistic for joint significance of instruments is 131.83 (*P*-value = 0.000).
- The *F*-statistic for overidentification is 7.190 (*P*-value = 0.207).
- The asterisks *, ** and *** indicate a significance level 10%, 5% and 1%, respectively.

We first look at the cooperative equation. In line with our expectations, we find that households are 5.4 percent more likely to join land cooperatives if household heads had off-farm before the start of the cooperative. This result is consistent with previous studies that households with off-farm employment are more likely to transfer land because land and labor are typically complements (Yao, 2000; Huang et al., 2012). Land

endowment shows a statistically significant and positive, albeit modest, effect (of approximately seven percent) on cooperative membership, which is also consistent with an earlier study (Rahman, 2010). Because the value of land decreases with distance from town, households in remote villages should be more likely to transfer land to cooperatives (Liu et al., 2016). However, in our estimates the effect of distance to town is only small, albeit positive and significant at the 10% level. The city dummy shows a significant and positive effect. Households in Suzhou are 10.3 percent more likely to participate in cooperatives than those in Yangzhou which may be driven by additional government subsidies in Suzhou.

In the off-farm equation we find that – in spite of the positive correlation (cf. Table 3.2) – cooperative membership has no statistically significant effect on household heads' current off-farm employment. Long et al. (2010) argue that because of strong barriers to labor migration in China land consolidation programs may not necessarily increase off-farm employment.

Household heads' age has a significant, negative, but small effect on current off-farm employment, probably because China's off-farm employment opportunities are often physically demanding and favor young adults (Uchida et al., 2009). Household heads' previous off-farm experience shows a significant and positive effect. With 39.9 percent, the average marginal effect is very large. Farmers who have previously worked off-farm might simply have continued their jobs. Community level party membership is statistically significant and positive with a magnitude of 7.4 percent, consistent with previous research showing that households with cadres have better job market prospects in China (Zhang and Li, 2003).

3.4.2 Heterogeneity

We explore other explanations for the lack of an effect of cooperative membership on off-farm employment. One reason may be heterogeneity in the sample that is related to the treatment effect. For instance, heterogeneity in agricultural human capital may interact with treatment. In the presence of land cooperatives, households may

increasingly specialize and adopt contrasting land and labor decisions (Yao, 2000). Some households may seek more off-farm employment, whereas others would specialize in agriculture, renting more land and giving up off-farm employment. In other words, what may look like an effect of zero, may be opposing effects in a heterogeneous population. We first explore this possibility by dropping households from the sample which have rented land from the cooperative. Because this sub-sample is rather small (only 32 observations), the results do not change substantially.

Households may also be heterogeneous with respect to the availability of surplus agricultural labor. We split the sample by the number of adults in the family who did not have off-farm employment before the land cooperative program. We call households with two or more family members without off-farm experience constrained. Otherwise, they are defined as unconstrained. Given the small land endowment in the study area, two or more family members without off-farm employment are a good indicator of surplus agricultural labor. We provide estimates for each sub-sample (Table 3.4). We remove the variable labor network from the model because of its high correlation with the measure that defines the two subgroups. All tests related to the quality of instruments perform well.

Table 3.4 shows significant differences between the two sub-samples. Household heads' off-farm experience becomes statistically insignificant in the cooperative membership equation for the constrained group. One specific person's off-farm employment is less important to cooperative membership if the household had many people without off-farm employment. The effect of household land endowment remains positive, though its statistical significance drops to nearly ten percent. The effect of family size on cooperative membership becomes positive and significant for the constrained group. This is in contrast to an earlier study showing that an increase in family size increases agricultural labor and thus should negatively affect land transfer (Zhang et al., 2004). However, the number of agricultural laborers might already have been adequately

captured by splitting the sample. Family size may then rather reflect the increase of family members employed in the off-farm sector, which might show a positive effect on membership in the cooperative. Consistent with the earlier finding that local elites are often more engaged in collective action (Platteau et al., 2014), the effect of party membership for the constrained group is significant and positive.

Another difference in the cooperative membership equation is observed for village characteristics in unconstrained households. We find that the effect of distance to town becomes zero for the unconstrained group. The value of land might play only a minor role who has worked off-farm for a long time. In line with earlier findings (Chen, 2015; Liu et al., 2016), average plot number per household in the village and cooperative leadership show a significant and positive effect.

Table 3.4 Determinants of Cooperative Membership and Off-farm Employment (Sub Samples)

Variables	Unconstrained households				Constrained households			
	Membership		Off-farm		Membership		Off-farm	
Membership			-0.013	(0.089)			0.212**	(0.087)
Household head age	0.003	(0.002)	-0.014***	(0.004)	-0.002	(0.002)	-0.009***	(0.003)
Male household head	-0.060	(0.097)	0.253**	(0.121)	-0.028	(0.093)	0.123	(0.146)
Household head education	0.007	(0.006)	0.003	(0.007)	0.005	(0.006)	-0.004	(0.006)
Household head off-farm experience	0.144**	(0.060)	0.295***	(0.068)	0.021	(0.042)	0.399***	(0.032)
Land area per adult	0.061	(0.039)	-0.020	(0.032)	0.086**	(0.035)	0.012	(0.027)
Number of land plots	0.025	(0.023)	0.007	(0.018)	0.015	(0.019)	0.018	(0.016)
Family size	-0.011	(0.017)	-0.002	(0.016)	0.028**	(0.013)	0.010	(0.016)
Dependency ratio	0.027	(0.055)	-0.058	(0.080)	-0.070	(0.077)	0.067	(0.099)
Asset level	0.033	(0.034)	-0.024	(0.033)	-0.017	(0.023)	0.048*	(0.026)
Party membership	-0.019	(0.051)	0.128***	(0.043)	0.066*	(0.037)	0.040	(0.043)
Distance to town	-0.004	(0.004)	0.009	(0.006)	0.006**	(0.003)	-0.004	(0.003)
Suzhou	0.131*	(0.079)	0.119**	(0.063)	0.126*	(0.069)	-0.016	(0.069)
Average household landholding	0.025	(0.016)			-0.013	(0.010)		
Average plot number per household	0.030**	(0.015)			-0.017	(0.016)		
Time since cooperative initiation	0.008	(0.011)			0.001	(0.006)		
Village cadre as cooperative leader	0.118**	(0.052)			0.024	(0.041)		
Group average of participation	0.459***	(0.077)			0.536***	(0.072)		
Generalized residuals			0.076	(0.058)			-0.114*	(0.065)

Pseudo R ²	0.4372	0.366	0.4947	0.486
Observations	248	248	297	297

Notes:

- a. Households with one or no agricultural laborer before the start of the cooperative fall into the unconstrained group. Otherwise, they fall into the constrained group.
- b. The table reports average marginal effect. Delta-method standard errors are in the parentheses.
- c. The *F*-statistic for joint significance of instruments for unconstrained and constrained households is 51.44 (*P*-value = 0.000) and 58.55 (*P*-value = 0.000), respectively.
- d. The *F*-statistic for overidentification for unconstrained and constrained households is 6.02 (*P*-value = 0.304) and 7.00 (*P*-value = 0.221), respectively.
- e. The asterisks *, ** and *** indicate a significance level 10%, 5% and 1%, respectively.

We also find some differences for the two groups in the effect of cooperative membership on household heads' current off-farm employment in the off-farm employment equation. Specifically, cooperative membership remains insignificant for the unconstrained group, but becomes significant and positive for the constrained group. The marginal effect of cooperative membership on off-farm employment for the constrained group is 21.2 percent. This is in line with our theoretical analysis. Unconstrained households may have decided on labor allocation before land cooperatives were introduced. With the establishment of land cooperatives, households have transferred their land without re-allocating labor. However, for the constrained group land cooperatives have affected labor allocation.

Similar to the full sample, male household heads have a positive effect in both subgroups, although the effect is statistically significant only for the unconstrained group. Male household heads are 25.3 percent more likely to have off-farm employment than females in the unconstrained sub-sample. A household's assets have a positive effect in the constrained group. Previous research has shown that initial wealth is important to facilitate off-farm employment (Atamanov and van den Berg, 2012). While party membership remains statistically significant for the unconstrained group, it becomes insignificant for the constrained group. The city dummy has a significant effect only for the unconstrained group. The more developed city Suzhou may provide more off-farm employment opportunities. However, for constrained households such opportunities may not translate into actual off-farm employment.

The differences in the causal effect of cooperative membership on household heads' off-farm employment between the constrained and unconstrained groups raises two additional questions. First, because household heads with off-farm employment experience are less likely to fall into the constrained group, does the effect mainly stem from household heads without prior off-farm employment experience? Second, because

Suzhou is more developed and offered better opportunities for off-farm employment in the past, households in Suzhou are also less likely to fall into the constrained group. We may thus ask if the effect is larger in Yangzhou.

Table 3.5 Marginal Effect for Cooperative Membership at Representative Values

Variables		Interactive effect model I		Interactive effect model II	
Cooperative membership	(Off-farm experience = 1)	0.071	(0.092)		
Cooperative membership	(Off-farm experience = 0)	0.203**	(0.102)		
Cooperative membership	(Suzhou = 1)			0.074	(0.090)
Cooperative membership	(Suzhou = 0)			0.141	(0.087)

Note:

- The table reports average marginal effect. Delta-method standard errors are in the parentheses
- The asterisk ** indicates a significance level of 5%.

To investigate these questions, we introduce an interaction terms between cooperative membership and household heads' off-farm experience, cooperative membership and the city dummy in Eq. (4). We then calculate the marginal effect of cooperative membership on household heads' current off-farm employment by varying the variables for household heads' off-farm experience and the city dummy at different values. Results are reported in Table 3.5. Consistent with our expectation, we find that the causal effect of cooperative membership on off-farm employment is only significant if household heads had no prior off-farm employment experience. The effect is also larger in Yangzhou (with statistical significance close to the 10% level).

3.4.3 Sensitivity Analysis

We used several tests to examine the sensitivity of our results. First, we estimated three standard probit models for Eq. (2), ignoring the potential endogeneity issue. While the results with the full sample and the unconstrained sample are generally consistent with our results, there is a large change in the effect of cooperative membership on household heads' off-farm employment for the constrained group, indicating a bias if the

endogeneity is not adequately dealt with.

Second, we re-estimate the control function estimator, using village average participation level as the only instrument. As shown in Table 3.3 and Table 3.4, the four village level instruments show only a small effect on cooperative membership for the full and constrained sample, which raises the concern of weak instruments and biased estimates. Third, we estimate the bivariate probit model, as demonstrated in the estimation strategy section. Score tests proposed by Murphy (2007) suggest that the null hypothesis of bivariate normally distributed error terms cannot be rejected, suggesting that the models are correctly specified. Results are reported in Table A 3- 1 and Table A 3- 2. Fourth, we use a “plug-in” approach which often complements the control function approach to test the robustness of our results. The “plug-in” approach estimates a probit model for Eq. (2) by replacing M with probit fitted values \hat{M} from Eq. (1). With all the approaches our initial results are qualitatively reproduced.

3.5 Conclusion

Despite the rapidly growing economy, rural land markets remain underdeveloped in rural China. As a consequence, a large share of the labor force is still employed in agriculture. To release surplus agricultural labor, China’s land cooperative program seeks to increase efficiency in land markets by consolidating scattered agricultural land. In this paper, we have analyzed the drivers of households’ membership in land cooperatives and the impact of cooperative membership on labor reallocation. We found that cooperative membership has a positive effect on household heads’ off-farm employment only for a sub-group of our sample. Households with surplus labor benefited most from the land cooperative program. Households in this group were approximately 20 percent more likely to have off-farm employment. Further analysis has shown that this effect is also pronounced for household heads without prior off-farm employment and households located in Yangzhou.

The heterogeneous treatment effects show that households use different strategies in dealing with the possibility to join a land cooperative. For households without surplus agricultural labor, working off-farm was not restricted by the access to land markets. Households in this group might have just entrusted their unfarmed land to relatives for low or no rents – a practice which for a long time was quite common in rural China (Kung, 2002). Here, we have only looked at the impact of membership on off-farm employment. It remains to be seen how much – if at all – these households would benefit from the program in other respects.

For households with surplus agricultural labor, access to land markets affects households' labor market decisions. Without access to efficient land markets, the gain from off-farm employment would have been too small. To stay in agriculture was an optimal decision before the land cooperative program. The stable land income from the cooperative is an improvement over the small compensations received from relatives in earlier times (Chen, 2015). Land cooperatives also improved households' property rights over land (Ito et al., 2016) which – as we have shown – will have a positive effect on transfers and off-farm employment.

In general, our results show that land cooperatives are effective in stimulating land transfers. For a large group of the sample, there are also consequences for labor market decision-making. In some instances, local authorities have been reported to put pressure on households to join the cooperative and to transfer land (Chen, 2015). It is apparently difficult to gather reliable data on this issue. Not accounting for the phenomenon may bias the estimates. If people are forced to participate in land cooperatives, there might not be a positive welfare effect from the program. Households will adjust their strategies under the constraint of losing land to the cooperative. Although households would still choose the best strategy, the overall welfare effects might be negative. Off-farm employment could then be the better among two worse alternatives. More research is needed to further investigate the issue of autonomy and welfare effects in land

cooperatives.

Acknowledgements

We thank the reviewers for the constructive comments, which have significantly improved the paper. Errors remain to the authors. This work was supported by the National Natural Science Foundation of China [grant numbers 71322301, 71673144 and 71173097], the Fundamental Research Funds for the Central Universities [grant numbers KJYQ201401], and the Specialized Research Fund for the Doctoral Program of Higher Education of China [grant number 20130097110038]. Special thanks go to the China Scholarship Council for supporting this research project.

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4 EMPIRICAL STUDY III:

DOES IT PAY TO PARTICIPATE IN DECISION-MAKING? SURVEY EVIDENCE FROM LAND CO-MANAGEMENT IN JIANGSU PROVINCE, CHINA

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Published in: Ecological Economics 143, pp. 199-209.

DOI: 10.1016/j.ecolecon.2017.07.023

Abstract: Members' participation in decision-making is a critical part of resource co-management. However, little is known about the welfare consequences of participation. This paper analyzes the impact of members' participation in decision-making on the income from cooperatives, using data from 364 members from China's land cooperative program. We distinguish two levels of participation in decision-making, voting and obtaining financial information. We use a bivariate probit model and propensity score matching to estimate the impact. The results indicate that household heads' age, gender and education, family size, wealth, and political affiliation determine participation in decision-making. Participation in either voting or obtaining financial information has a positive impact on members' land income. There is also a strong joint effect of voting and obtaining information with an increase in land income of more than 16 percent. We conclude that broad participation can ensure more equitable access to land income for members.

Keywords: Land Cooperative; Elite Capture; Benefit Distribution; Propensity Score Matching

4.1 Introduction

Over the past thirty years, policies and programs in natural resource management have developed towards co-management in developing countries across the globe (Agrawal and Ostrom, 2001; Mansuri and Rao, 2012; Persha and Andersson, 2014), with the key objective of decentralizing decision-making (Baynes et al., 2015). Generally, co-management requires resource users to actively participate in decisions on the use of natural resources (Behera, 2009). By including local people in decision-making processes, co-management programs overcome information asymmetries commonly found in top-down approaches. It also allows for the integration of local and indigenous knowledge in resource management (Blaikie, 2006; Dasgupta and Beard, 2007). In addition, co-management programs often aim at an equitable benefit distribution from resource use and may generally provide a more sustainable way to manage natural resources (Agrawal, 2001; Adhikari et al., 2004; Tachibana and Adhikari, 2009).

Despite its popularity, co-management often fails to achieve its objectives, particularly in terms of the devolution of decision-making (Acemoglu and Robinson, 2008; Mansuri and Rao, 2012). Decision-making processes are often captured by local elites (Saito-Jensen et al., 2010; Lund and Saito-Jensen, 2013), and less affluent households have little voice in these processes (Mansuri and Rao, 2012; Thondhlana et al., 2015), casting doubt on the inclusiveness of decision-making in co-management programs. A lack of inclusiveness in decision-making prevents that all people's preferences are adequately reflected in the institutional setup and operation of co-management programs. The access to benefits then critically depends on decisions made by people who control the program (Bardhan, 2002).

Although earlier studies investigated benefit distribution between elites and non-elites in co-management programs, there is to date limited knowledge on the question to what extent, engagement in decision-making processes can affect the program members' benefits. Empirical studies show that in some cases, elites who control

decision-making processes act in their own interests and, as a consequence, benefit disproportionately (Platteau and Gaspart, 2003; Kamoto et al., 2013). In other cases, however, benefits are distributed more evenly – even in the presence of elite control (Dasgupta and Beard, 2007; Fritzen, 2007). More recent studies have investigated the welfare effects of membership in co-management programs, implicitly assuming that households take an active part in co-management activities (Jumbe and Angelsen, 2006; Mazunda and Shively, 2015; Rahut et al., 2015). Active participation is often operationalized by investigating attendance rates in meetings (Prokopy, 2009) or the occupation of posts in the organization (Agrawal and Gupta, 2005). However, it has been recognized that not all members in co-management programs attend meetings and that those who do may not necessarily be involved in decision-making (Chhetri et al., 2013; Lestari et al., 2015).

The objective of this paper is to analyze the impact of members' participation in decision-making on their income from co-management. We develop a new approach to participation in co-management for resource management. Specifically, we argue that one must distinguish between different levels of involvement in the organization. First, members may control the fate of their organization by taking part in elections, for instance, if leaders are selected. Second, members may choose different levels of effort when gathering information about important developments concerning the organization (Fritzen, 2007). We provide here the first quantitative analysis on the benefits of members obtained from a co-management program that distinguishes between different levels of engagement. Doing so will enhance our understanding of collective action in natural resource management, explicitly acknowledging the demand for greater inclusiveness in co-management (Prokopy, 2005; Li et al., 2014).

In our empirical analysis, we focus on the land cooperative program, a policy for the co-management of community-owned agricultural land in China. While there are many studies focusing on co-management in Africa or South Asia (Dasgupta and Beard,

2007; Fritzen, 2007; Mansuri and Rao, 2012; Kamoto et al., 2013), few studies have dealt with China. The land cooperative program is popular in eastern China, particularly in Jiangsu Province, where our study is located. Unlike co-management programs that evolve from a top-down governance approach in other countries (Mansuri and Rao, 2012; Ayers and Kittinger, 2014), the land cooperative program evolved from the household responsibility system under which land resources have been managed de facto freely by villagers for many years.

The paper is organized as follows: Section two introduces the land cooperative program in China and develops a theoretical framework on the causal channels of participation in decision-making on land income. Section three describes our data collection and empirical strategy. Section four presents the results, followed by a discussion in section five, and a conclusion and policy implications in section six.

4.2 Background and Context

4.2.1 The Land Cooperative Program

Since the 1970s, rural land in China has been managed under the household responsibility system. Ever since, farm households have been able to contract with village committees for agricultural land, which was primarily distributed according to household size, labor availability or both in the family. Households were free to cultivate the land they received and could retain land revenues, as long as they paid taxes and grain quotas to the government. Such tax and grain quota delivery obligations, however, were removed nationwide in 2006. Earlier, contracts had a duration of 15 years and then were extended to 30 years. In 2008, a document from the central government explicitly stated that the contracting relationship should be stable and unchanged for permanence and a land market should be encouraged (CCCPC, 2008). In this sense, land distributed under the household responsibility system can be seen as de facto private property.

Although the household responsibility system has substantially contributed to rural and

economic development in China (Rozelle and Swinnen, 2004), repeating land adjustment according to changes in family size and labor availability to achieve egalitarian land distribution has led to land fragmentation (Tan et al., 2006). Land fragmentation continues to be a problem because of the poorly developed land markets. Until 2006, in Jiangsu Province, one of the most developed areas in the market economy in China, less than 10% of the agricultural land had been rented in the market (Liu et al., 2017). Meanwhile, rapid industrialization and urbanization have provided many employment opportunities in the urban sector, allowing for labor migration and the consolidation of agricultural land. A key objective of the land cooperative program is therefore to consolidate fragmented land, with a particular emphasis on efficiency gains and large-scale commercial farming.

The land cooperative program started in the 1990s in Guangdong Province. In 2002, it spread to Jiangsu Province and has been widely practiced after the introduction of the cooperative law in 2007. Under the land cooperative program, villages are free to establish land cooperatives that fulfill the function of local land markets (Ho and Lin, 2003; Chen, 2015). Households who want to quit farming can transfer land to the cooperative and become members of the cooperative. The cooperative consolidates the land by hiring farm employees to cultivate the land or by leasing the land to farmers who bid the highest price (Liu et al., 2016).

The land cooperative program embraces co-management principles, i.e., it encourages the active participation of members in decision-making (Chen, 2015). According to the Regulations of Jiangsu Province on Specialized Farmers' Cooperatives (2009), major decisions must be made jointly by members in regular meetings. Decisions concern, for instance, the revision of by-laws and regulations and the selection of managers, board members, and member representatives. Large land cooperatives have the opportunity to delegate authority to representatives (elected by a general assembly) who will act on behalf of all members. In addition, the distribution of revenues among

members is decided upon in meetings. At least once a year, meetings will also report on the financial performance. Both the distribution of revenues and financial information are made available to members via booklets or posters at the office of the cooperative. Members then have the opportunity to obtain such information by visiting the office of the cooperative.

In exchange for land, cooperative members receive land income as land rent and dividend (Chen, 2015). Land rent per mu (a Chinese unit of area, in which one mu equals 0.07 hectare) is a fixed income component regardless of the profitability of land cooperatives. It guarantees a minimum land income for households. A dividend is a variable income component determined by a cooperative's profit and the shares a household owns in the cooperative (Tian and Zhu, 2013). Typically, one mu of land is exchanged for one share. However, the exchange rate may be adjusted by various factors. For example, Yep (2015) shows that larger households or households with fewer old and young members often receive more shares. Such exchange rules undermine the transparency of the exchange processes, because ordinary members cannot keep track of everyone else's land area or demographic characteristics. The exchange process and the follow-up dividend distribution can therefore be described as a black box from the member's perspective that is under the control of cooperative leaders or member representatives. Our field survey indicates that households often cannot distinguish land rent and dividend. In addition, they do not know how many shares they own in the cooperative, which makes it easy for cooperative power holders to manipulate the dividend distribution.

4.2.2 Impact of Participation in Decision-making on Land Income

Democratic governance can be partially or entirely undermined by existing power holders (Acemoglu and Robinson, 2008). Households who have power in co-management programs may capture benefits at the expense of others (Pérez-Cirera and Lovett, 2006). In the land cooperative program, only a small proportion of members have actively participated in decision-making processes, and different levels

of engagement might exist. Following Fritzen (2007), we distinguish between (1) participation in elections, including the revision of by-laws and regulations or the selection of board members and representatives (hereafter VOTE), and (2) obtaining cooperative's financial information (hereafter INFORMATION). We now consider how participation in the two levels of engagement in decision-making can affect the land income received from the cooperative.

The access to benefits may be affected by VOTE if there is room for manipulation in the process. Mansuri and Rao (2004) show that transparency in decision-making is necessary for achieving fair benefit distribution. In the land cooperative program, the exchange process of land to shares and the distribution of variable dividends are under the control of cooperative leaders or member representatives. To stay in the leadership position, the selected program leaders or representatives represent the interest of active members, i.e., those who participated in elections (Labonne and Chase, 2009). They may manipulate the dividend distribution in favor of their electorate, either by setting a higher exchange rate of land to shares or by paying higher dividends per share. In addition, INFORMATION may affect a member's land income. On the one hand, information asymmetries may explain rent-seeking activities in resource co-management (Behera and Engel, 2006). On the other hand, rather than being passive recipients, beneficiaries often bargain with those in charge of distributing benefits to secure greater shares, particularly if they possess relevant financial information (Reinikka and Svensson, 2004). In contrast, beneficiaries who lack important information tend to accept offers without renegotiating. Thus, we expect a positive impact of participation in INFORMATION on the land income received by cooperative members.

There may also be a joint effect of VOTE and INFORMATION. Olken (2007) demonstrates that elite capture, in particular, occurs if a program's financial information can be more easily accessed by beneficiaries with personal ties to program

leaders. Leaders will redistribute benefits in favor of beneficiaries who are close to them and who have better access to financial information. In the same vein, leaders may not fear protest from members who do not know about the financial information of the cooperative if these members do not participate in voting. Applying these arguments, we expect a positive joint effect of VOTE and INFORMATION on land income received by cooperative members.

4.3 Data and Empirical Strategy

4.3.1 Data Collection

We use data from a household survey conducted in 2014 in two cities of Jiangsu Province, namely, Suzhou and Yangzhou. The two cities have the highest number of registered land cooperatives, and Jiangsu Province is representative of the developed areas of coastal China, where the land cooperative program has reached large coverage (Tian and Zhu, 2013). Relative to other income sources, household income from agricultural land is relatively low in Jiangsu Province. However, particularly for poor households, it remains an important component of total household income (Liu et al., 2016).

From a list of all villages with land cooperatives in the province, we randomly selected 60 villages from Suzhou and Yangzhou. In each village, we sampled on average ten households, using the random walk technique. Households that did not participate in the land cooperative program at the time of data collection were excluded from the dataset, leading to a total of 364 households used for analysis. A team of undergraduate and graduate students from Nanjing Agricultural University was trained to conduct face-to-face interviews. Household heads or other knowledgeable household members were interviewed. We used a structured questionnaire that asked for detailed information on household members' demographic characteristics, communist party affiliation, land endowments, other assets, cooperative membership and income, and participation in the cooperative's decision-making process.

4.3.2 Empirical Strategy

We are interested in the effect of participating in elections (VOTE) and obtaining information (INFORMATION). Members decide on their level of participation in decision-making in the cooperative, and this decision may be driven by a number of factors, i.e., it is not random. To estimate the causal effects of decision-making on income, we need to construct an appropriate counterfactual, which can be achieved by propensity score matching (PSM).¹² PSM assumes that the selection into treatment is based on observed exogenous factors and avoids the restrictions on model specifications for the relationship between outcome and predictors of outcome (Rosenbaum and Rubin, 1983). It has been demonstrated that PSM yields results that resemble randomized assignment to treatment, commonly known from experimental designs (Smith and Todd, 2005; Abadie and Imbens, 2006). The idea of PSM is to estimate a selection function from which “statistical twins” are matched based on the estimated probability for selection into treatment. Typically, PSM uses logit or probit models to estimate the probability of selecting into binary treatments. However, if there is more than one treatment, other models are needed to estimate the selection function, particularly in the presence of correlation between treatments.

Lechner (2002) and Gerfin and Lechner (2002) propose a multinomial logit model to estimate the propensity score of treatments against non-treatment when there are several mutually exclusive treatments. If there are two treatments that are not mutually exclusive, Prokopy (2009) suggests a bivariate probit model for estimating the treatment effect before performing PSM. In this paper, we use the bivariate probit model for estimating the determinants of the two treatments. Unlike Prokopy (2009), we estimate propensity scores based on the bivariate probit model rather than a

¹² For a comparison of different methods to address selection bias, please refer to Ali et al. (2016).

standard probit model because the bivariate probit model is preferred for the calculation of propensity scores if the error terms are correlated (Becker and Egger, 2013). We also form four possible combinations of the two treatment variables (as shown in Table 4.1) and use an inverse probability weighting estimator with the selection function of the multinomial logit model as a robustness test.

Table 4.1 Sample Distribution in Different Situations

Decision-making	INFORMATION = 1	INFORMATION = 0	Total
VOTE = 1	Situation One (S1) = 70	Situation Two (S2) = 34	104
VOTE = 0	Situation Three (S3) = 25	Situation Four (S4) = 235	260
Total	95	269	364

Sources: Authors' computation

The first dependent variable in the selection function VOTE takes the value of one for households that participate in voting and zero otherwise. The variable INFORMATION takes the value of one for households know about cooperative financial information and zero otherwise. Both variables are self-reported by the respondents. Table 4.1 displays the frequencies of the four possible treatment combinations. The majority of households are absent from both VOTE and INFORMATION. Approximately one fifth of the sample takes part in both activities, and approximately five to ten percent are engaged in one of the two activities.

(1) Estimating Participation: Bivariate Probit Model

Following Greene (2008), the resulting bivariate probit model can be defined as:

$$VOTE^* = \alpha X + \varepsilon_1; VOTE = 1 \text{ if } VOTE^* > 0 \quad (1)$$

$$INFORMATION^* = \beta X + \varepsilon_2; INFORMATION = 1 \text{ if } INFORMATION^* > 0 \quad (2)$$

$$cov(\varepsilon_1, \varepsilon_2) = \rho \quad (3)$$

where $VOTE^*$ and $INFORMATION^*$ are latent variables representing the utility of participation in VOTE and INFORMATION, respectively. If $VOTE^*$ exceeds zero, we

will observe a household participating in voting. Similarly, if INFORMATION* exceeds zero, we will observe a household accessing knowledge about the balance of payments. The covariance of the error terms ε_1 and ε_2 is indicated by ρ and takes the value of zero if the two decisions are independent, which would mean that the standard probit model is sufficient to estimate the determinants of the two decisions. If there is correlation, i.e., ρ is significantly different from zero, the bivariate probit model is preferred for the estimation of propensity scores.

(2) Impact Assessment: Propensity Score Matching

We follow Lechner (2002) in estimating propensity scores from a bivariate probit model. Let j denote the decision-making situation in which a cooperative member falls (cf. Table 4.1). The probability of participation in each situation is defined as:

$$\hat{P}_j(x); \quad j \in J = \{1,2,3,4\} \quad (4)$$

The resulting pair-wise propensity scores are computed as:

$$\hat{P}^{j|m}(x) = \frac{\hat{P}_j(x)}{\hat{P}_j(x) + \hat{P}_m(x)}; \quad j \neq m \quad (5)$$

where j and m belong to the situation set $J = \{1,2,3,4\}$. They can be an individual situation or a combination of situations. $\hat{P}^{j|m}(x)$ are the predicted conditional propensity scores of a cooperative member participating in situation j against situation m . In this study, we assess the impact of participating in two types of decision-making processes – VOTE and INFORMATION – against their counterparts. We are also interested in estimating the joint effect of participating in both decisions or only in one of the two as opposed to not participating at all. Thus, five types of propensity scores are computed.

$$\hat{P}^{1,2|1,2,3,4}(x) = \frac{\hat{P}_1(x) + \hat{P}_2(x)}{\hat{P}_1(x) + \hat{P}_2(x) + \hat{P}_3(x) + \hat{P}_4(x)} \quad (6)$$

$$\hat{p}^{1,3|1,2,3,4}(x) = \frac{\hat{p}_1(x) + \hat{p}_3(x)}{\hat{p}_1(x) + \hat{p}_2(x) + \hat{p}_3(x) + \hat{p}_4(x)} \quad (7)$$

$$\hat{p}^{1|1,4}(x) = \frac{\hat{p}_1(x)}{\hat{p}_1(x) + \hat{p}_4(x)} \quad (8)$$

$$\hat{p}^{2|2,4}(x) = \frac{\hat{p}_2(x)}{\hat{p}_2(x) + \hat{p}_4(x)} \quad (9)$$

$$\hat{p}^{3|3,4}(x) = \frac{\hat{p}_3(x)}{\hat{p}_3(x) + \hat{p}_4(x)} \quad (10)$$

The average treatment effect for the treated (ATT) after matching can then be estimated as:

$$ATT^{j|m} = E\{Y_j - Y_m | J = j\}; \Delta j \neq m \quad (11)$$

We apply the commonly used nearest neighboring (NN) matching algorithm to form statistical twins (Caliendo and Kopeinig, 2008). To increase the quality of matching and to decrease possible bias, we restrict matching within common support and allow for matching with replacement. We use NN with three matching partners. Weights are equally distributed. We use t-tests to identify differences in outcomes between the treated units and their matching partners.

4.3.3 Variables Used in Estimating Propensity Scores

Generally, variables in the selection function should be simultaneously associated with participation and the outcome (Caliendo and Kopeinig, 2008). Caliendo and Kopeinig (2008) also suggest that selected independent variables must be strictly exogenous and unaffected by the participation decisions. The selected variables, therefore, should either be measured before participation in the treatment or be time-invariant. Other authors argue that variables for estimating propensity scores may also be selected following a different set of criteria (Heckman and Navarro-Lozano, 2004). Most studies emphasize the importance of adjusting differences between the treated and untreated and use variables that – based on theoretical considerations – are more important for selection than for the outcome (Prokopy, 2009; Park and Wang, 2010; Mazunda and Shively, 2015; Rahut et al., 2016). Ameha et al. (2014) select variables

that are theoretically important for determining the outcome. In line with previous studies (Prokopy, 2009; Park and Wang, 2010; Mazunda and Shively, 2015), we base our selection function on variables that predominately affect participation rather than the outcome.

We use the variables shown in Table 4.2 in the selection function. We control for household heads' age, gender and education. Households with young, male and educated household heads are more likely to participate in co-management (Rahut et al., 2015). Household size and dependency ratio serve as indicators of labor availability (Prokopy, 2009; Liu et al., 2016). Households with surplus labor are more likely to participate in co-management activities (Prokopy and Thorsten, 2008; Prokopy, 2009). We add the area of land transferred to the land cooperative program to the selection function, and we expect a positive effect on households' participation in decision-making. The more land a household has transferred, the more important it is to secure a high land income and to influence the decision-making. Arguably, households decide how much land they would like to transfer first. Hence, the variable is exogenous to the participation decision.

Table 4.2 Variables Used in the Selection Function

Variables	Description
Age	Age of the household head (years)
Male	= 1 if the household head is male; otherwise = 0
Education	Years of schooling of the household head (years)
Family size	Number of family members
Dependency ratio	The number of family members older than 65 or younger than 15 divided by family size
Land area	Land area the household transferred to the land cooperative program (mu)
Asset	The number of houses and cars the household owns
Party membership	= 1 if the household has communist party member(s); otherwise = 0
Distance town	Distance to town (km)
Suzhou	= 1 if the household is from Suzhou; otherwise = 0

Note: Authors' computation

We also introduce a household's assets and communist party membership to the selection function. Case study research has shown that wealthy households and households with political ties have more power to influence decisions in their interest (Dasgupta and Beard, 2007; Mansuri and Rao, 2012). For instance, Prokopy (2009) finds that households with more assets are more likely to attend collective meetings, and Vargas et al. (2016) shows that traditional leaders tend to talk longer in group discussions on public matters. We use the number of key assets, such as cars and houses, as an indicator of wealth in rural China (Feng et al., 2010).

We also add the locational information, such as distance to town and city, in the selection function. The impact of distance to town on participation is twofold. On the one hand, households close to the town could be less interested in participation due to the greater availability of non-agricultural income opportunities. On the other hand, households in areas close to urban centers may show more interest in participation due to the better access to policy information (Gelo and Koch, 2014). Moreover, the distance to town also affects the land value and as a consequence the cooperative's income. The city dummy is introduced to control for regional differences. Land is on average more valuable in Suzhou than in Yangzhou. In addition, Suzhou provides financial support for forming cooperatives under the land cooperative program (Liu et al., 2016), which may also increase the land income in the city.

A key assumption of the PSM is that there are no omitted variables in the selection function, which is known as un-confoundedness. However, practically, it is impossible to control for all the relevant variables, and there is no straightforward method to test the validity of this assumption (Caliendo and Kopeinig, 2008). As an alternative, the sensitivity of the results from different model specifications should be tested. Following Abate et al. (2016), we re-estimate the impacts of participation in decision-making processes using a reduced model specification of the selection function by dropping several important variables. The results from the reduced model are compared with the original model and serve as a sensitivity test.

Note that the villages included in this study may be structurally different from each other. Such differences may affect the governance of land cooperatives and create differences in the tendency of households' participation in decision-making processes between villages. For example, in some villages more households may participate in decision-making processes, while in other villages, only a few households may participate. As a result, error terms may not be independent from the village, and we thus use standard errors clustered at the village level (Mazunda and Shively, 2015).

4.4 Results

4.4.1 Descriptive Statistics

Table 4.3 shows descriptive statistics for the sampled households, disaggregated by their participation status. There are a number of statistically significant differences. For instance, household heads who participate in VOTE are younger and more educated. The households also have a lower dependency ratio and more assets, and they are more likely to live in Suzhou and to have a communist party member in their family. We find similar differences for participation in INFORMATION. Low variance inflation factors indicate that there is no problem with multicollinearity.

Our outcome variable of interest is the land income per mu (hereafter land income) received from the land cooperative, which can more easily be compared between villages due to larger differences in the absolute figure of land endowments (Yadav et al., 2015). Table 4.4 shows the land income received by the sampled households from the land cooperatives. On average, households who participate in both VOTE and INFORMATION receive the largest land income. Households who participate in either VOTE or INFORMATION receive a smaller land income. Those who do not participate receive the lowest income. Table 4.3 and Table 4.4 show that there are systematic differences between participants who differ in their co-management activities. We therefore need to address the self-selection by using PSM to arrive at unbiased estimates of the treatment effect.

Table 4.3 Sample Mean and Comparisons for Selected Independent Variables

Variables	VOTE			INFORMATION		
	Yes	No	Difference	Yes	No	Difference
Age	58.81	62.03	-3.22***	56.85	62.61	-5.76***
Male	0.95	0.95	0.00	0.96	0.95	0.01
Education	8.45	6.87	1.59***	9.04	6.71	2.33***
Family size	4.05	3.89	0.16	3.98	3.92	0.06
Dependency ratio	0.31	0.38	-0.06*	0.29	0.38	-0.10**
Land area	4.10	4.10	-0.00	4.09	4.11	-0.01
Asset	2.05	1.58	0.47***	2.00	1.61	0.39***
Party membership	0.59	0.28	0.31***	0.55	0.30	0.24***
Distance to town	6.41	6.22	0.19	6.26	6.28	-0.02
Suzhou	0.93	0.78	0.15***	0.94	0.79	0.15***
Obs.	104	260		95	269	

Notes: Authors' computation. Differences are tested by means of a two-sided unpaired t-test for the metric variables and a two-sided unpaired test of proportions for the binary variables; *** p<0.01; ** p<0.05; * p<0.10

Table 4.4 Average Land Income per Mu

Situations	Obs.	Land income per mu	
		Mean	S.D.
VOTE = 1 (S1 and S2)	104	859.84	262.37
VOTE = 0 (S3 and S4)	260	760.62	251.80
INFORMATION = 1 (S1 and S3)	95	856.96	258.37
INFORMATION = 0 (S2 and S4)	269	764.96	254.62
VOTE = 1, INFORMATION = 1 (S1)	70	868.76	250.24
VOTE = 1, INFORMATION = 0 (S2)	34	841.49	288.80
VOTE = 0, INFORMATION = 1 (S3)	25	823.94	282.64
VOTE = 0, INFORMATION = 0 (S4)	235	753.89	248.02

Note: Authors' computation. Mu is a Chinese unit of area, in which one mu equals 0.07 hectare

4.4.2 Explaining Participation in Decision-making

Table 4.5 presents estimates from a bivariate probit model explaining the determinants of households' participation in co-management activities. We also report the results from a standard probit model in Table A 4- 1. The two models yield qualitatively

similar results. Because the covariance ρ of the error terms in the bivariate probit model is 0.776 and significantly different from zero, we should nonetheless use the estimates from the bivariate probit model.

Table 4.5 Determinants of Participation in Decision-making

Variables	Bivariate probit model			
	VOTE		INFORMATION	
Age	- 0.010	(0.010)	- 0.022 **	(0.011)
Male	0.557 *	(0.313)	0.870 **	(0.430)
Education	0.057 *	(0.030)	0.100 ***	(0.032)
Family size	- 0.095	(0.059)	- 0.103 *	(0.058)
Dependency ratio	- 0.060	(0.282)	- 0.058	(0.347)
Land area	0.006	(0.034)	0.017	(0.035)
Asset	0.287 ***	(0.074)	0.204 ***	(0.077)
Party membership	0.720 ***	(0.141)	0.594 ***	(0.160)
Distance to town	0.016	(0.026)	0.012	(0.020)
Suzhou	0.731 **	(0.285)	0.805 ***	(0.304)
Constant	- 2.117 **	(0.906)	- 1.959 **	(0.862)
Correlation coefficient	0.776 ***	(0.066)		
Log likelihood	- 315.98			
Number of observations	364			

Notes: Authors' computation; The table reports coefficients; Standard error clustered at village level in parentheses; *** p<0.01; ** p<0.05; * p<0.10

Households with older household heads are less likely to participate in either VOTE or INFORMATION activities. The impact of household heads' age on INFORMATION is significant at the 5% level, consistent with an earlier finding that young members are more likely to participate in co-management activities (Rahut et al., 2015). However, its impact on VOTE is non-significant, suggesting that household heads' age is not an important predictor for participating in VOTE. Male-headed households are more likely to participate in both decision-making activities, which is consistent with the study of Vargas et al. (2016), who find that females are less likely to speak up in group discussion in a co-management program in Colombia.

Household heads' education shows a significant positive impact on participation. Educated community members are more likely to participate in co-management because effective participation critically depends on households' capacity to express themselves and to access knowledge (Rao and Ibanez, 2005; Lestari et al., 2015). In addition, educated community members may be better in formulating community needs vis-à-vis external actors and in facilitating the implementation of participatory programs (Mansuri and Rao, 2012).

A household's assets and communist party membership positively impact participation in co-management, which is in line with previous findings (Vargas et al., 2016). Local elites, e.g., wealthier and politically connected households, often control the decision-making in co-management (Dasgupta and Beard, 2007; Mansuri and Rao, 2012). Family size has a negative impact on participating in either VOTE or INFORMATION. The statistical significance is at the 10% or near the 10% level. This is in line with earlier findings from Prokopy and Thorsten (2008), who find that larger families are less likely to participate in co-management activities. One explanation could be that a larger family can better support the household's livelihood if they engage in other sectors, and consequently, an income effect will discourage labor input in co-management activities (Uchida et al., 2009).

4.4.3 Impact of Participation on Land Income

We use here the propensity scores from the bivariate probit model presented earlier (Table 4.5). Table A 4- 2 in the appendix shows the number of treated households whose propensity scores falls within the scope (on-support) or beyond the scope (off-support) of the untreated households' propensity scores for each of the five pair-wise comparisons. Figure A 4- 1 to Figure A 4- 5 show the distribution of pair-wise propensity scores between treated and untreated units. Given the skewed ratio in the number of observations of treated and untreated households, several untreated households are off-support, whereas only a few treated samples are off-support. It is therefore easy for the treated households to be matched with the

untreated households but more difficult for the opposite direction. In this situation, it is difficult to calculate the average treatment effect, but it is advised to use the average treatment effect on the treated (Caliendo and Kopeinig, 2008). Observations that are off-support (either treated or untreated) are not included in our computation of the impact.

Table 4.6 reports the impact of participation in VOTE and INFORMATION on land income. Participation in either VOTE or INFORMATION shows significant and positive impacts on household income from the cooperative program. Households who participate in VOTE receive on average 856.54 RMB Yuan per mu from the cooperatives, which is approximately 100 RMB Yuan or 13% more than in the control group. Households who participate in INFORMATION receive on average 858.67 RMB Yuan or 83.21 RMB Yuan more than in the control group. The increase of income from participation in INFORMATION is approximately 11%.

Table 4.6 Impact of Participation in Co-management Activities on Land Income

Decision-making	Income (Treated)	Income (Control)	Absolute difference	Relative difference	S.E.	T-statistic
VOTE (S1 and S2 against S3 and S4)	856.54	755.48	101.06	13%	30.72	3.290 ***
INFORMATION (S1 and S3 against S2 and S4)	858.67	775.46	83.21	11%	32.65	2.548 **
Both VOTE and INFORMATION (S1 against S4)	868.05	749.99	118.06	16%	36.75	3.212 ***
Only VOTE (S2 against S4)	841.49	714.74	126.75	18%	49.08	2.582 ***
Only INFORMATION (S3 against S4)	823.94	719.30	104.64	15%	66.07	1.584 †

Notes: Authors' computation; Matching algorithm is nearest neighboring matching with three partners from control groups within common support; *** p<0.01; ** p<0.05; † p<0.15

Table 4.6 also shows the joint and separate effects of participation in VOTE and INFORMATION. While the sizes of the effects are similar, the statistical significance

differs. Specifically, we find that households' participation in both VOTE and INFORMATION increases land income by approximately 16%. Households' participation solely in VOTE increases income by 18%. Households' participation solely in INFORMATION increases income by 15%. Most differences between treatment and control groups are statistically significant at the 1% level. For INFORMATION, the estimates show wider confidence intervals, and the effect is, thus, less certain.

4.4.4 Robustness Tests

We conduct three additional analyses to test the robustness of our results. First, we separately re-estimate the impact of the five treatments with one or two matching partners from the control groups. An increase in the number of matching partners increases matching efficiency but may cause matching bias (Caliendo and Kopeinig, 2008). The results (available from the authors upon request) show no qualitative change in the treatment effect but lead to a small decrease in the level of statistical significance due to the smaller number of observations.¹³

Second, we assess to what extent the PSM estimators may be biased if the assumption of un-confoundedness does not hold. We estimate a reduced model specification of the selection function (cf. Abate et al., 2016). This model specification excludes two location variables, the distance to town and the city dummy, which omits important information and could, thus, bias the results. Estimation results are presented in Table A 4- 3 in the appendix. There are no qualitative differences in the treatment effects or

¹³ Our results remain qualitatively the same even with standard PSM. Tests on matching quality – such as covariate balancing, the value of R^2 , and the joint significance of variables before and after matching – all perform well. Sensitivity tests after kernel matching using standard PSM indicates that the critical values of hidden bias for the positive impacts which are statistically significant at 10% level (including VOTE, INFORMATION, both VOTE and INFORMATION, and only VOTE) fall in the ranges of 1.70-1.75, 1.25-1.30, 1.75-1.80, and 1.00-1.05, respectively.

the level of statistical significance.

Third, special attention should be paid to the estimates of joint and separate effects of participation in VOTE and INFORMATION due to the relatively small sample size of the households who participate in these activities. PSM was originally developed for treatment effects with large sample sizes (Rosenbaum and Rubin, 1983). For small sample sizes, PSM may lead to biased estimates. An IPW approach has been widely used to address this problem, with a particular emphasis on small sample size (Gelo and Koch, 2014; Mazunda and Shively, 2015; Mishra and Sam, 2016).

In IPW, the treatment variable is defined as having four different values (as shown in Table 4.1), with $S1 = 3$, $S2 = 2$, $S3 = 1$ and $S4 = 0$. By estimating a multinomial logit model with the reference category of situation four (S4), IPW calculates the propensity score but employs a propensity score weighting rather than the matching approach to evaluate the impact of multiple treatments. An important advantage of propensity score weighting is that it works better for small samples (Mazunda and Shively, 2015). We employ the IPW, using both the original set of variables and the reduced set of variables for re-estimation. Table 4.7 displays the results, which reproduce our earlier findings from Table 4.6.

Table 4.7 Robustness Test from Inverse Probability Weighting Method

Models	Treatments	ATT	Robust S.E.	Z-statistic
Original model	Both VOTE and INFORMATION (S1 against S4)	153.26	43.62	3.51 ***
	Only VOTE (S2 against S4)	93.03	46.93	1.98 **
	Only INFORMATION (S3 against S4)	125.05	81.45	1.54 †
Reduced model	Both VOTE and INFORMATION (S1 against S4)	140.48	39.14	3.59 ***
	Only VOTE (S2 against S4)	96.35	46.27	2.08 **
	Only INFORMATION (S3 against S4)	110.82	75.11	1.48 †

Notes: Authors' computation; *** $p < 0.01$; ** $p < 0.05$; † $p < 0.15$

4.5 Discussion

We find that participation in either voting or obtaining financial information in land cooperatives has a positive impact on members' land income, which is consistent with earlier findings showing that rent-seeking arises due to weak accountability and information asymmetries (Behera and Engel, 2006). Our findings support the notion that those in power will act in their own interest and realize an over-proportionate share of the benefits (Platteau and Gaspart, 2003; Prokopy, 2009; Kamoto et al., 2013). In other words, there is no benevolent rule (Dasgupta and Beard, 2007; Fritzen, 2007) in the land cooperative program. Some authors have also argued that people in power may trade favors in the co-management domain for increasing their political power in other domains (Kyamusugulwa and Hilhorst, 2015). In the Chinese case, such links are less likely to exist, which may create a situation in which those who participate act more selfishly.

While the evidence on the impact of participation in voting is strong, there is greater uncertainty regarding the impact of obtaining information. Obtaining information has a significant impact only if combined with voting. Part of this uncertainty is due to the small sample size. In addition, differences in access to benefits may be more likely to occur if program financial information is only known by people who are well connected to program leaders (Olken, 2007). For households who do not participate in voting, it could be harder to secure cooperative benefits even if they obtain financial information. As a result, these households may not succeed in increasing their benefit when bargaining with program leaders.

4.6 Conclusion and Policy Implications

In this paper, we assessed the impact of participating in decision-making in the land cooperative program in rural China using a bivariate probit model and the propensity score matching technique. We distinguish two types of decision-making – voting activities and receiving cooperatives' financial information. We find that households'

participation in decision-making is determined by household characteristics. In particular, wealthier households and households who have communist party members in the family are more likely to participate in both types of decision-making. Although land cooperatives are supposed to establish democratic and representative governance structures, the dominance of decision-making by wealthy and politically connected households casts doubt on the inclusiveness of land cooperatives' governing bodies.

The analysis on the impact of participation in decision-making reveals that participation in decision-making has a positive effect on households' benefits from land cooperatives. Specifically, households who participate in either voting activities or receiving financial information in land cooperatives obtain more land income from cooperatives. The effect is particularly strong if households participate in both voting activities and receiving financial information. The effect is also significant if households participate in only voting activities, while the effect is uncertain if households participate in only receiving financial information.

Our results have some important policy implications. The differences in land income between participants and non-participants in decision-making suggest that on the one hand, the accountability of decision-makers should be ensured to protect households who may not be able to participate from being exploited. On the other hand, a wide participation in decision-making processes should be encouraged. Specifically, the costs of participation should be as low as possible. Policy interventions should be applied so that major decision activities also include disadvantaged groups, such as the poor and those without political ties. In addition to booklets or posters, important financial information should be provided in a more convenient manner that, for example, allows easy access by members in their homes.

In our study, land income is self-reported by households and refers to the official incomes received. There may be additional unreported income for those who control decision-making, and we may rather have underestimated the impact of participation in

decision-making. Because of the small sample size, a disaggregated analysis on the income received by different types of households is difficult. While it was our primary objective to assess the impact of decision-making on land income, future studies may also focus on investigating distributional aspects, such as differences between elite and non-elite households in the program.

Acknowledgements

We are grateful for comments received from two anonymous reviewers that helped us to improve the paper. This work was supported by the National Natural Science Foundation of China [grant numbers 71322301, 71673144 and 71173097], the Fundamental Research Funds for the Central Universities [grant number KJYQ201401], and the Specialized Research Fund for the Doctoral Program of Higher Education of China [grant number 20130097110038]. Special thanks go to the China Scholarship Council [grant number 201408080019] for supporting this research project.

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5 SUMMARY AND CONCLUSION

Co-management of natural resources has long been on political agendas in countries such as South Africa, Malawi, India, Nepal and Philippines and China (Berkes, 2009; Njaya et al., 2012; Chhetri et al., 2013; Baynes et al., 2015). While the trend to co-management of natural resources is ongoing, empirical knowledge on the success factors and impacts of co-management programs remains limited. This has led to a knowledge gap about the impacts and mechanisms of co-management and insufficient knowledge for policy design. As a consequence, many natural resources co-management programs have failed to encourage the local population to participate, and many programs do not achieve their objectives (Mansuri and Rao, 2004; Persha and Andersson, 2014).

This thesis addressed this gap by analyzing success factors and impacts of a particularly prominent resource co-management program – the land cooperative program – in rural China. The aim was to investigate how local actors' characteristics and contexts influence the success of the land cooperative program regarding three key dimensions: the inclusion of land, cooperative membership, and members' participation in decision-making. Findings can improve our understanding of the land cooperative program, and several findings may also be transferred to shed light on other resource co-management programs.

In the rest of this chapter, I first recapitulate and synthesize the key results and contribution of the empirical papers. Then, I point out the limitations of the thesis and present an outlook on further empirical work related to the land cooperative program. Finally, I develop policy recommendations.

5.1 Key Results and Contributions

5.1.1 Paper I: Cooperative Coverage and Local Elites

Paper one considers the success of land cooperatives at the collective action level. It

addresses the question: which types of villages are suitable for the adoption of the program? To answer this question, the paper identifies different attributes of villages best suited for the adoption of the land cooperative program. Linear regression models and tobit regression models were employed. Several key findings are derived from this analysis.

First, local institutions and policies matter. In particular, the proportion of land dedicated to cooperatives is larger if the town government assesses village leaders' effort to promote cooperatives. In addition, the relative amount of land managed by cooperatives is higher in Suzhou. A plausible explanation is that Suzhou provides financial support to land cooperatives; whereas Yangzhou does not. This finding underpins results of Ito et al. (2016) who find that financial support has been an important factor for cooperative policy adoption in China.

Second, village characteristics matter. Village market access (distance to town) shows a significant and positive effect on the proportion of land transferred to cooperatives. The closer to the town, the higher the value of land due to lower costs of transportation (Osabuohien, 2014). In addition, the amount of land in cooperatives is larger if more households in the village had off-farm employment, or if the average household landholding in the village was small. These results suggest that villages that were less dependent on agriculture were more likely to transfer land to cooperatives.

Third, local elites play an important role in the development of land cooperatives. The amount of land in cooperatives is larger if local elites, such as government officials, village cadres or highly educated people, become cooperative leaders. These results for the first time provide quantitative evidence to support case study evidence on the positive role of local elites in the collective action for resource co-management (Dasgupta and Beard, 2007; Balooni et al., 2010; Kyamusugulwa and Hilhorst, 2015). The paper also demonstrates that during the life cycle of an organization, government officials are more effective as leaders in the early stages of the cooperative. Government officials have good access to policy information, and it is easier for them to

receive initial financial support from the local government. In contrast, if village cadres and educated people become cooperative leaders, there is a positive long-run impact thanks to their close ties with local households and their entrepreneurial orientation.

5.1.2 Paper II: Cooperative Membership and Off-farm Employment

Paper two considers the success of co-management at the level of cooperative membership. It focuses on two questions: a) which types of households are more likely to have cooperative membership?; b) does cooperative membership result in households' labor reallocation? To answer the two questions, the paper identifies factors which affect households' membership decision. A control function approach was employed to identify the causal effect of cooperative membership on household heads' current off-farm employment. Several key findings are derived from the analysis.

First, household heads' off-farm experience before cooperative initiation in the village positively affects households' cooperative membership, although the effect is small for households with many agricultural laborers. Households with more land are also more likely to participate in land cooperatives. These results are consistent with the literature on land markets which finds that households with off-farm employment and higher land endowments are more likely to transfer land (Yao, 2000; Rahman, 2010; Huang et al., 2012).

Second, when households had little agricultural labor before cooperative initiation, their decision of cooperative membership is affected by the average number of land plots per household in the village and cooperative leadership. Specifically, when the land is highly fragmented or cooperative leadership is occupied by village leaders, households are more likely to participate in cooperatives. These results imply that cooperative membership of households which had little agricultural labor is driven by village level factors.

Third, although the land cooperative program aims to release agricultural labor, there is

no evidence of a positive effect of cooperative membership on household heads' current off-farm employment. However, cooperative membership increases household heads' off-farm employment if households already had many agricultural laborers prior to program initiation. Further evidence suggests that such positive effects are only valid for household heads without off-farm employment experience.

5.1.3 Paper III: Decision-making and Access to Benefit

Paper three considers the success of co-management at the decision-making level. It addresses two questions: a) which types of cooperative members are more likely to participate in decision-making in land cooperatives?; b) does the participation in decision-making affects members' access to benefits from cooperatives? To answer the first question, the paper identifies the factors which affect the participation in two levels of engagement – voting activities and obtaining financial information – in cooperative decision-making. To answer the second question, the paper employs a novel matching technique to compare the income from cooperatives between members who have participated in decision-making and those who have not. Several key findings are derived from this analysis.

First, households with male or more educated household heads are in general more likely to participate in the two decision-making processes. Household heads' age is an important predictor for seeking information. Households who are rich or have communist party membership are also more likely to participate in either type of decision-making, which is consistent with earlier findings that wealthy and politically well-connected households, often control the decision-making in co-management (Dasgupta and Beard, 2007; Mansuri and Rao, 2012). Larger families tend to stay away from participation because they can better support households' livelihoods if they engage in off-farm sectors, which is common in rural China. Consequently, an income effect will discourage labor input in co-management activities (Uchida et al., 2009).

Second, households' participation in either voting activities or obtaining financial information leads to a significant increase in land income received from cooperatives.

There is also a strong joint effect of participating in both types of decision-making. Approximately a 16% increase in resource income can be achieved if households participate in both, voting activities and obtaining financial information. Participation in voting activities can also increase households' income from land cooperatives. However, the evidence on the effect of participation in obtaining financial information is relatively weak.

5.1.4 Linking the Empirical Results

In this section, I synthesize the results by comparing the findings from the three empirical papers. Such synthesis generates new insights regarding the success of the land cooperative program in China.

The first insight is that the support of off-farm employment is a key concept in the implementation of the land cooperative program. As shown in paper one, cooperatives in villages which had more households engaging in off-farm activities before the start of the program receive more land. Consistent with paper one, paper two demonstrates that households headed by people who had off-farm employment before the start of the program are more likely to transfer land to cooperatives. In addition, in line with the objective of the program, land cooperatives increase the probability of household heads' current off-farm employment if they had no off-farm employment before transferring land to the cooperative. These results suggest that the mobility of factors and well-developed labor markets are preconditions to implement the land cooperative program.

The second insight is that local elites play a complex role in land cooperatives. Compared to non-elites, local elites are more likely to participate in and dominate decision-making in land cooperatives. On the one hand, the inclusion of local elites in decision-making can drive households' participation, and consequently increase the amount of land dedicated to cooperatives thanks to their leadership ability and close ties with governments and households. On the other hand, households who participate

in decision-making often receive greater cooperative benefits than their less engaged counterparts, raising the concern of elite capture. The results of my thesis show that the involvement of local elites cannot only contribute to the expansion of land co-management and achieve the objective of land consolidation in rural China, but it may also undermine good governance in land cooperatives.

5.2 Limitations and Future Research

There are some limitations arising from the data used in the thesis. First, the household data were collected based on the random walk technique, because a random selection of households could not be achieved. Randomly selected households were often hard to reach because family members could be working beyond the village. Moreover, village leaders might have asked some pro-policy villagers to replace the randomly selected households due to the sensitivity of the topic. Thus, the random walk technique was used as an alternative, although it might introduce a selection bias.¹⁴

Second, most household information was self-reported by the respondents rather than officially documented. While a systemic tendency may not occur in the neutral information (e.g. family size, land area and so on), it may occur if sensitive information is concerned, such as benefits from land cooperatives, especially when some of these benefit are illegal.¹⁵ As a result, the effect of participation in decision-making would be underestimated, yet, the general inferences of the thesis would not be affected.

Third, the use of a structured questionnaire and a quantitative analysis often ignores much information to save cost. As a result, an in-depth understanding of households' participation in land cooperatives is restrained. For example, many household

¹⁴ For example, because villagers with off-farm work were less likely to be surveyed due to absence from home, the effect of co-management membership on off-farm employment might be underestimated.

¹⁵ For example, corrupt members who were in power in the land cooperative program may underreport the real land income distributed from the program.

characteristics did not exert a significant effect. Although this is partly due to the opposing effects of household characteristics in heterogeneous observations, the possibility that a lack of autonomy in households' participation could in principal drive some of the results. If the lack of autonomy would be large, land cooperatives might exhibit even a negative net effect on households' welfare. Future research may, thus, employ qualitative analysis to investigate the motivation of households' participation in land cooperatives.

5.3 Policy Recommendations

The thesis reveals that the success of resource co-management programs may be influenced by the local context of villages. Policy makers in China should realize that not all villages are suitable for the land cooperative program. Despite the land cooperative program's ability to address land fragmentation, a "one-size-fits-all" policy should be avoided. Villages which have less agricultural land and more households working off-farm – and which consequently depend less on agriculture – should be primarily targeted to develop land cooperatives. Villages close to the town center, on the contrary, have higher land values and should not be targeted due to the high costs to pay households.

Policy makers should also re-consider the use of financial or political instruments to promote households' participation in the land cooperative program. On the one hand, the evaluation on village leaders' performance in the development of the land cooperative program, for example, can significantly improve the inclusiveness of the land cooperative program. On the other hand, such policy instruments may create strong incentives for local elites to exert negative power on households' participation in the program. Ensuring households' voluntary participation in the implementation of the program is a key, especially for households that do not have access to alternative livelihood sources, such as off-farm employment.

Policy makers should pay attention to the development of off-farm labor markets. Mobility of workers and a well-developed labor market are preconditions for households' participation in land cooperatives and a guarantee for securing households' livelihoods if they participate. Policy instruments should focus on improving households' access to off-farm employment. In particular, policies should also secure the livelihood of older farmers, because they face greater challenges in finding off-farm employment after transferring land out.

The role of local elites should be carefully considered in policy design. From the perspective of policy implementation, local elites should not be excluded from the cooperative leadership because they can effectively implement the policy and consolidate fragmented farmland. However, their power in decision-making should be restricted, especially when decision-making is about benefit distribution. To balance the elites' power, more members from the non-elite households, e.g., the poor and those without social networks, should be encouraged to participate in decision-making. The importance of transparency in decision making, functional assembly meetings and control boards representing member interest and accountability in the governance of land cooperatives should be highlighted.

The current rules on benefit distribution can generally be described as a black box. In the future, more transparent rules on benefit distribution should be designed. Members' access to the cooperatives' financial information should be provided in an inexpensive form. For example, rather than reporting such information in the way of posters or booklets, information should be accessible by members at home so that they can track the financial situation of the organization more easily.

The land cooperative program is one of the most influential land reforms in China for the last decade. It addresses the issue of imperfect local factor markets commonly known also in most other transition economies, i.e., South America and Post-Communist Europe. It stands out from the recent land reform efforts in those countries by targeting mobility of labor, land consolidation, and a participatory

governance of land resources. In rural China much has been achieved in this regard, but much remains to be done. Results of this research contribute to the explanation of what has worked where and why as well as to informing necessary amendments in China's land policy in the future.

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APPENDIX

Appendix 1: Supplementary Tables to “Community-based Agricultural Land Consolidation and Local Elites: Survey Evidence from China”

Table A 2- 1 Results from Tobit Models

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Dist_town	2.499*** (0.744)	2.481*** (0.744)	2.465*** (0.746)	2.153*** (0.667)	2.107*** (0.659)
Off_farm	0.323** (0.145)	0.317** (0.146)	0.323** (0.143)	0.267* (0.143)	0.265* (0.141)
Landholding	-5.798*** (2.049)	-5.694*** (2.076)	-5.769*** (2.012)	-5.361** (2.047)	-5.284** (2.032)
Plot_no.	4.013 (2.883)	4.123 (2.848)	4.037 (2.873)	4.161 (2.829)	4.240 (2.795)
Evaluation	23.528** (9.455)	23.281** (9.555)	23.278** (9.376)	22.172** (9.111)	21.790** (9.111)
Duration	-2.607 (2.189)	-2.532 (2.214)	-2.498 (2.161)	-3.106 (2.153)	-2.958 (2.160)
Suzhou	46.960*** (10.918)	45.621*** (11.281)	46.222*** (10.792)	47.800*** (10.909)	46.420*** (11.162)
Education		3.613 (8.079)			1.584 (8.027)
Official_vill			6.976 (9.493)		7.571 (9.485)
Official_gov				30.217** (14.445)	30.225** (14.327)
Constant	14.514 (17.875)	12.893 (18.817)	8.117 (19.639)	18.545 (17.070)	10.885 (19.613)
1/sigma	36.133*** (3.068)	36.058*** (3.100)	36.000*** (3.097)	35.350*** (3.001)	35.170*** (3.037)
F	15.744	13.940	13.974	14.052	11.395
Pseudo R ²	0.091	0.091	0.091	0.096	0.097
Observations	120	120	120	120	120

Source: Authors' computations

Notes: Robust standard errors are presented in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.10.

Table A 2- 2 OLS Regressions with Natural Log Transformations

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Ln_Distance	14.118*** (3.948)	13.960*** (3.939)	13.813*** (3.955)	13.009*** (3.913)	12.638*** (3.822)
Ln_Off_farm	9.299*** (2.747)	9.002*** (2.781)	9.513*** (2.749)	8.267*** (2.685)	8.346*** (2.670)
Ln_Landholding	-11.770** (5.090)	-11.395** (5.182)	-11.869** (5.116)	-12.150** (5.014)	-12.062** (5.135)
Ln_Plot.no.	2.621 (5.421)	3.063 (5.243)	2.748 (5.482)	3.222 (5.315)	3.559 (5.251)
Evaluation	15.285** (7.085)	15.113** (7.141)	15.011** (6.964)	15.072** (6.821)	14.716** (6.790)
Suzhou	37.345*** (7.443)	35.904*** (7.857)	36.220*** (7.522)	35.954*** (7.364)	34.140*** (7.811)
Duration	-2.452 (1.542)	-2.348 (1.581)	-2.295 (1.520)	-2.619* (1.465)	-2.410 (1.487)
Education		3.948 (5.921)			1.929 (5.921)
Official_vill			9.118 (7.720)		9.099 (7.704)
Official_gov				21.640*** (6.895)	21.440*** (6.791)
Constant	-8.811 (17.338)	-9.803 (18.044)	-17.559 (18.433)	-3.096 (16.794)	-12.363 (18.339)
F	30.339	26.230	26.634	26.550	20.990
Adjusted R ²	0.477	0.475	0.478	0.498	0.495
Observations	120	120	120	120	120

Source: Authors' computations

Notes: Robust standard errors are presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The top four variables are log transformed. For variables with a value of zero, log transformations were calculated as the value of the variables plus 1.

Table A 2- 3 OLS Regression Based on A Sample without Extreme Values

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Dist_town	1.719*** (0.597)	1.712*** (0.599)	1.752*** (0.589)	1.475** (0.558)	1.507*** (0.543)
Off_farm	0.261** (0.117)	0.261** (0.119)	0.277** (0.114)	0.201* (0.116)	0.217* (0.116)
Landholding	-3.702** (1.836)	-3.613* (1.850)	-3.516** (1.727)	-3.521* (1.827)	-3.329* (1.740)
Plot_no.	1.919 (3.232)	1.987 (3.253)	1.222 (3.366)	3.402 (2.936)	2.720 (3.107)
Evaluation	26.416*** (7.986)	26.391*** (8.007)	26.576*** (7.572)	25.508*** (7.873)	25.667*** (7.555)
Suzhou	27.260** (13.333)	26.259* (13.635)	27.214** (13.285)	25.702** (12.608)	25.542* (13.023)
Duration	-5.399*** (1.680)	-5.335*** (1.750)	-5.129*** (1.660)	-5.463*** (1.651)	-5.190*** (1.683)
Education		2.167 (7.509)			0.266 (7.603)
Official_vill			11.074 (9.845)		10.826 (10.343)
Official_gov				25.330** (10.852)	25.188** (9.865)
Constant	33.237** (16.044)	31.822* (17.211)	22.188 (17.976)	32.987** (16.057)	22.013 (18.776)
F	12.736	11.071	10.963	13.626	10.835
Adjusted R ²	0.388	0.379	0.390	0.416	0.409
Observations	76	76	76	76	76

Source: Authors' computations; Notes: Robust standard errors are presented in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.10.

Appendix 2: Supplementary Tables to “Can Land Transfer through Land Cooperatives Foster Off-farm Employment in China”

Table A 3- 1 Estimation from Bivariate Probit Model (Full Sample)

Variables	Membership		Off-farm	
Membership			0.608	(0.422)
Household head age	0.000	(0.009)	-0.046***	(0.010)
Male household head	-0.172	(0.420)	0.797	(0.563)
Household head education	0.032	(0.024)	0.001	(0.020)
Household head off-farm experience	0.300**	(0.150)	1.654***	(0.182)
Land area per adult	0.398***	(0.145)	0.035	(0.105)
Number of land plots	0.101	(0.092)	0.051	(0.064)
Family size	0.070	(0.068)	0.076	(0.054)
Dependency ratio	-0.049	(0.272)	-0.229	(0.275)
Asset level	-0.009	(0.100)	0.077	(0.073)
Party membership	0.261	(0.168)	0.350**	(0.156)
Labor network	-0.031	(0.097)	-0.069	(0.102)
Distance to town	0.016	(0.011)	0.008	(0.017)
Suzhou	0.591***	(0.212)	0.263	(0.290)
Average household landholding	-0.019	(0.039)		
Average plot number per household	0.013	(0.044)		
Time since cooperative initiation	0.000	(0.024)		
Village cadre as cooperative leader	0.246*	(0.146)		
Group average of participation	2.670***	(0.283)		
Constant	-2.903***	(0.872)	0.307	(0.915)
ρ	-0.267	(-0.297)		
Observations	545			

Note:

- Coefficients are reported in the table. Clustered standard errors are in the parentheses
- The asterisks *, ** and *** indicate a significance level 10%, 5% and 1%, respectively.

Table A 3- 2 Estimation from Bivariate Probit Model (Subgroup Sample)

Variables	Unconstrained				Constrained			
	Membership		Off-farm		Membership		Off-farm	
Membership			0.169	(0.439)			1.020***	(0.362)
Household head age	0.020	(0.014)	-0.072***	(0.020)	-0.013	(0.012)	-0.041***	(0.014)
Male household head	-0.313	(0.554)	1.330**	(0.623)	-0.238	(0.564)	0.525	(0.727)
Household head education	0.035	(0.038)	0.015	(0.036)	0.028	(0.031)	-0.018	(0.030)
Household head off-farm experience	0.854**	(0.369)	1.502***	(0.398)	0.099	(0.222)	1.897***	(0.263)
Land area per adult	0.379	(0.236)	-0.117	(0.163)	0.563***	(0.217)	0.054	(0.124)
Number of land plots	0.139	(0.136)	0.031	(0.094)	0.075	(0.107)	0.082	(0.087)
Family size	-0.061	(0.096)	-0.009	(0.085)	0.169**	(0.075)	0.052	(0.075)
Dependency ratio	0.169	(0.324)	-0.311	(0.418)	-0.285	(0.417)	0.336	(0.491)
Asset level	0.194	(0.202)	-0.123	(0.176)	-0.085	(0.129)	0.230*	(0.122)
Party membership	-0.119	(0.296)	0.663***	(0.248)	0.405**	(0.205)	0.187	(0.195)
Distance to town	-0.025	(0.020)	0.045*	(0.027)	0.026*	(0.014)	-0.017	(0.016)
Suzhou	0.715	(0.461)	0.533*	(0.302)	0.715*	(0.373)	-0.079	(0.317)
Average household landholding	0.134	(0.089)			-0.074	(0.057)		
Average plot number per household	0.186**	(0.085)			-0.098	(0.089)		
Time since cooperative initiation	0.057	(0.066)			-0.002	(0.035)		
Village cadre as cooperative leader	0.687**	(0.319)			0.135	(0.213)		

Group average of participation	2.775***	(0.511)			3.002***	(0.446)		
Constant	-5.857***	(1.676)	2.062	(1.486)	-2.023	(1.257)	0.019	(1.068)
ρ	0.215	(0.287)			-0.595*	(0.253)		
Observations	248				297			

Note:

- Households with one or no agricultural laborer before the start of the cooperative fall into the unconstrained group. Otherwise, they fall into the constrained group.
- Coefficients are reported in the table. Clustered standard errors are in the parentheses.
- The asterisks *, ** and *** indicate a significance level 10%, 5% and 1%, respectively.

Appendix 3: Supplementary Tables to “Does It Pay to Participate in Decision-making? Survey Evidence from Land Co-management in Jiangsu Province, China”

Table A 4- 1 Determinants of Participation in Decision-making

Variables	Standard probit model			
	VOTE		INFORMATION	
Age	- 0.009	(0.010)	- 0.020 *	(0.011)
Male	0.530 *	(0.300)	0.742 *	(0.416)
Education	0.058 **	(0.029)	0.098 ***	(0.031)
Family size	- 0.083	(0.058)	- 0.101 *	(0.057)
Dependency ratio	- 0.071	(0.291)	- 0.106	(0.344)
Land area	0.008	(0.033)	0.020	(0.035)
Asset	0.269 ***	(0.070)	0.207 ***	(0.075)
Party membership	0.709 ***	(0.142)	0.574 ***	(0.160)
Distance to town	0.017	(0.026)	0.013	(0.021)
Suzhou	0.688 **	(0.286)	0.715 **	(0.301)
Constant	- 2.129 **	(0.912)	- 1.866 **	(0.862)
Log likelihood	- 185.26		- 172.38	
Pseudo R ²	0.149		0.175	
Number of observations	364		364	

Source: Authors' computation; standard error clustered at village level in parentheses

Note: *** p<0.01; ** p<0.05; * p<0.10

Table A 4- 2 The Number of Treated Households on(off)-support

	VOTE	INFORMATION	Both VOTE and INFORMATION	Only VOTE	Only INFORMATION
On-support	99	90	65	34	25
Off-support	5	5	5	0	0

Notes: Authors' computation; a treated household is on-support when its propensity score falls within the scope of the propensity scores of all the untreated households. Otherwise, it is off-support.

Table A 4- 3 Impacts Using PSM from Reduced Bivariate Probit Model

Decision-making	Treated	Control	Absolute difference	Relative difference	S.E.	T- statistic
VOTE	859.90	761.18	98.73	13%	28.57	3.46 ***
INFORMATION	858.67	762.10	96.57	13%	32.88	2.94 ***
Both VOTE and INFORMATION	872.24	766.56	105.67	14%	39.26	2.69 ***
Only VOTE	841.49	730.11	111.38	15%	50.17	2.22 **
Only INFORMATION	823.94	715.87	108.07	15%	59.11	1.83 *

Notes: Authors' calculations; Matching algorithm is nearest neighboring matching with three partners from control groups within common support; *** p<0.01; ** p<0.05; * p<0.10

Figure A 4- 1 Distribution of Pair-wise Propensity Scores ($\hat{P}^{1,2|1,2,3,4}$)

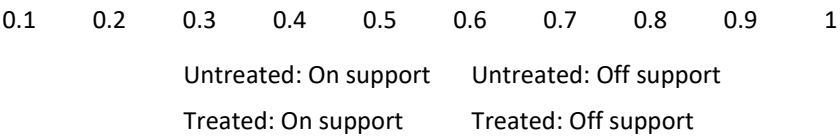


Figure A 4- 2 Distribution of Pair-wise Propensity Scores ($\hat{P}^{1,3|1,2,3,4}$)

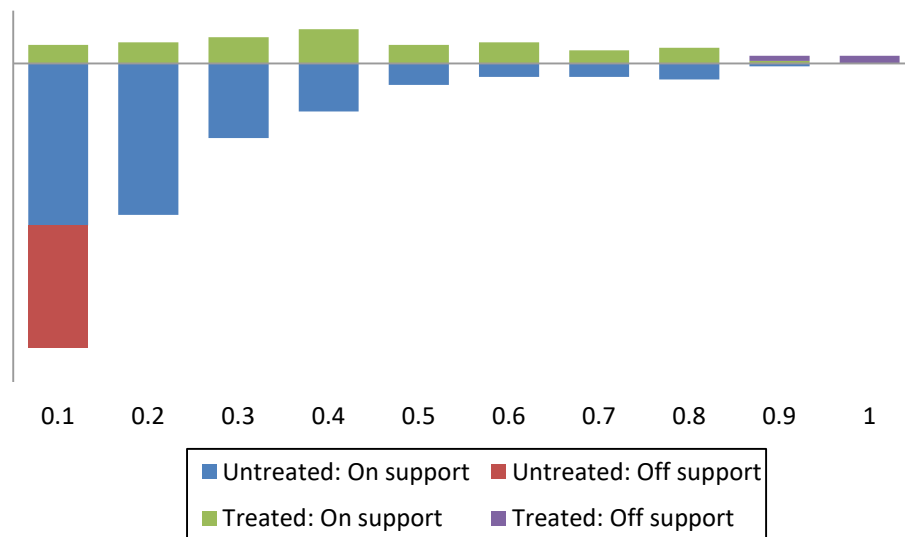


Figure A 4- 3 Distribution of Pair-wise Propensity Scores ($\hat{P}^{1|1,4}$)

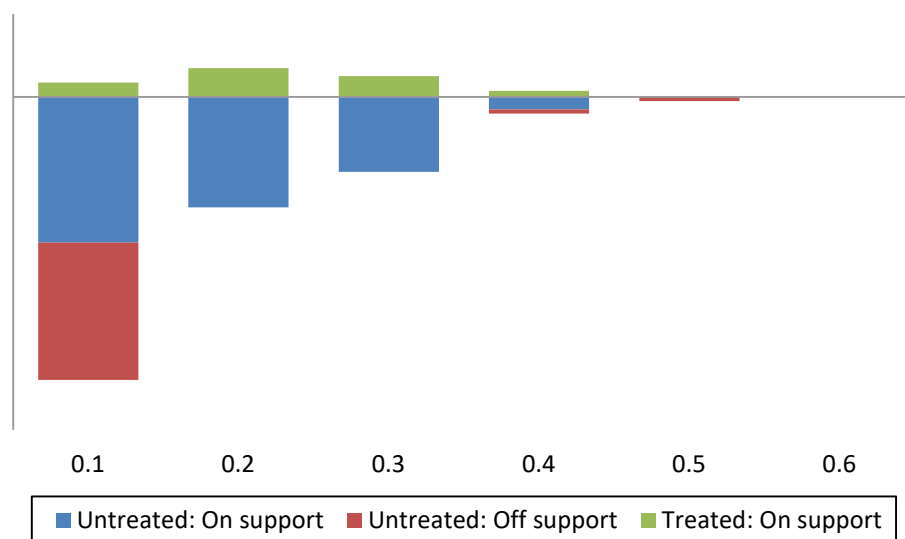


Figure A 4- 4 Distribution of Pair-wise Propensity Scores ($\hat{P}^{2|2,4}$)

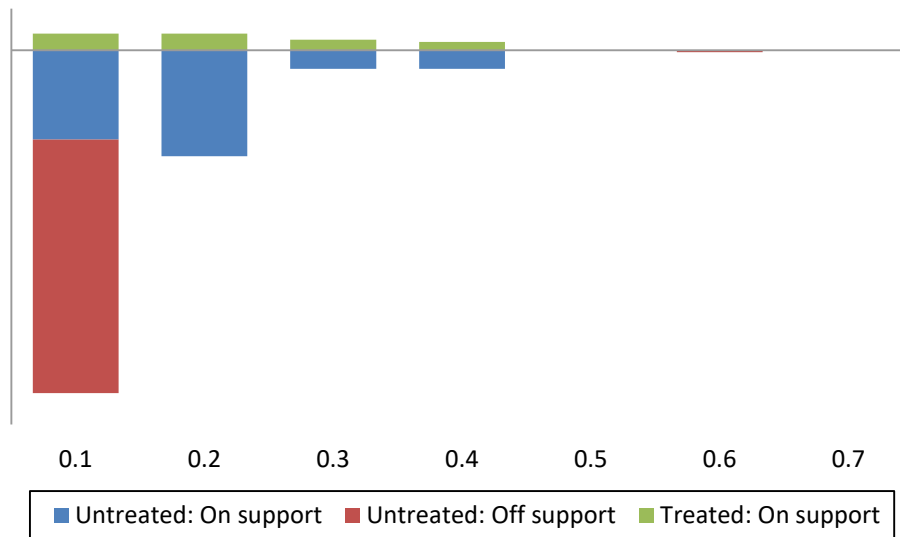


Figure A 4- 5 Distribution of Pair-wise Propensity Scores ($\hat{P}^{3|3,4}$)

Appendix 4: Questionnaires

This is part of the full version of the questionnaire. It covers the major questions to obtain information used in the thesis. The full version of questionnaire is not presented here and serves for other research projects led by Professor Shuyi Feng from Nanjing Agricultural University.

Questions in the Village and Cooperative Questionnaire

General Information about the Questionnaire

Questionnaire Code:

Location of Survey:

Survey Date:

Interviewer:

Consistency checker:

Section 1: Information about the Village

1. Your name:
2. Your position in the village committee:
3. Your phone number:
4. What is the officially registered name of the land cooperative?
5. When was the cooperative initiated?
6. How far is it from the village committee to the location of the city government?
7. How far is it from the village committee to the location of the county government?
8. How far is it from the village committee to the location of the town government?
9. How many farmlands are there in the village?
10. On average, how many plots did every household own before the initiation of the land cooperative program?
11. How much percentage of households in the village

- purely worked in off-farm sector before the initiation of the land cooperative program? _____
12. How much percentage of households in the village purely worked in farm sector before the initiation of the land cooperative program? _____
13. How much percentage of households in the village worked in both off-farm and farm sector before the initiation of the land cooperative program? _____
14. How many households have transferred their land to the land cooperative? _____
15. In total, how much land in the village has been transferred to the land cooperative? _____
- 16.. Is the scale of the land cooperatives related to the political evaluation of the rural cadres? _____

Section 2: Information about the Cooperative Director

17. What is the name of the land cooperative director? _____
18. Is the cooperative director male or female? Male ☐; Female ☐ _____
19. What is the age of the cooperative director? _____
20. How many years of education does the director have? _____
21. Is the cooperative director a communist party member? Yes ☐; No ☐ _____
22. Has the cooperative director ever been a government official? Yes ☐; No ☐ _____
23. Has the cooperative director ever been a village cadre? Yes ☐; No ☐ _____

24. Has the cooperative director ever been an entrepreneur?

Yes ☐; No ☐

Questions in the Household Questionnaire

General Information about the Questionnaire

Questionnaire Code:

Location of Survey:

Survey Date:

Interviewer:

Consistency checker:

Section 1: Information about Individual Farmer

1. The first family member's information

Relationship with the household head	Household head
Age	
Gender	Male <input type="checkbox"/> ; Female <input type="checkbox"/>
Years of education	
A communist party member?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
A government official?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
A village cadre?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
Had non-agricultural experience before 20__ (Please refer to the time of program initiation in the village level questionnaire)	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
Has an agricultural employment in 2013?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
If yes, what is the income in 2013?	
Has a non-agricultural employment in 2013?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>

If yes, what is the income in 2013?

2. The second family member's information

Relationship with the household head

Questions from 1.1 to 1.9 repeat until all the family members' information is obtained.

Section 2: Information about Land Endowment

3. Land Plot

Area of plot number 1

Area of plot number 2

... ..

Question repeats until all the plots' information is obtained.

Section 3: Information about Participation in Land Cooperative

4. Have you transferred land to (participated in) the land cooperative in the village?

Yes ☐; No ☐

5. If the answer for the above question is yes, then how much land has your family transferred to the land cooperative?

6. How many shares does your family have in the land cooperative?

7. In 2013, how much money has your family received from the land cooperative?

among which, fixed income is

	dividend income is	_____
	income from government subsidy is	_____
8.	Has any of your family members ever participated in devising or revising cooperative regulation?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
9.	Has any of your family members ever participated in voting activities, e.g. the selection of cooperative representatives or cooperative administrative staff?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
10	Is it possible for the members to access the cooperative's financial information?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>
	If yes, how?	_____
11.	Do you know the yearly cost and benefit of the land cooperative?	Yes <input type="checkbox"/> ; No <input type="checkbox"/>

Section 4: Information about Households' Major Assets

12	How many houses does your family have?	_____
	When did you buy or build the first house?	_____
	What was the price or cost?	_____
	When did you buy or build the second house?	_____
	What was the price or cost?	_____
	_____
13	How many cars and trucks does your family have?	_____
	When did you buy the first one?	_____
	What was the price or cost?	_____
	When did you buy the second one?	_____

What was the price or cost?

... ..

DECLARATION

I declare that the content of this work has not been submitted in whole or in part for any other degree in any other university or institution. I confirm that the work is original and my own, except where reference has been made and where work has been indicated as co-authored publications. My contribution and those of the other authors to the work have been explicitly declared in an additional document, following the Doctoral Degree Regulation (05.03.2015) of the Faculty of Life Sciences. I acknowledge that the copyright of published papers within this thesis resides with the copyright holders of those papers. I give permission for the digital version of my thesis to be made available on the web via Humboldt-Universität zu Berlin's digital research repository, the library search, and also through web search engines.

Ziming Liu

Berlin, November 2017